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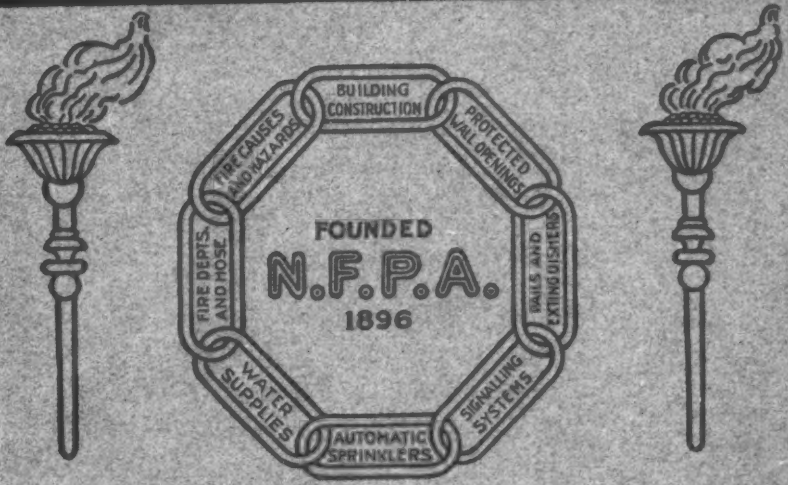
QUARTERLY
OF THE

NATIONAL FIRE PROTECTION ASSOCIATION



"To Promote the Science and Improve the Methods of Fire Protection and Prevention."

PUBLISHED QUARTERLY AT BOSTON, MASS., BY THE
NATIONAL FIRE PROTECTION ASSOCIATION

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Vol. 28 January, 1935 No. 3

QUARTERLY

OF THE

National Fire Protection Association

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National Fire Protection Association

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Reports of fires appearing in the Quarterly are copies of or extracts from written reports forwarded to the Association. This Association, as a body, is not responsible for the statements or opinions of any of its members.

Donald Barton Studio.

The Fitchburg, Mass., High School fire at its height. Local authorities thought this school building would not burn and carried no insurance (see page 260).

The Quarterly

Vol. 28 January, 1935 No. 3

Underwriters' Laboratories' Changes.

The passing of Dana Pierce, universally admired and beloved chief officer of Underwriters' Laboratories, whose sudden death was chronicled in our January NEWS LETTER, takes from us the second president of that distinguished organization whose intelligence and devotion were written into the development of the N.F.P.A. William H. Merrill, the founder-president, was the first, and he entered into our counsels almost at the beginning; for the N.F.P.A. and the Laboratories were born almost at the same time. Mr. Merrill had in him something akin to genius. He had courage, high imagination, and the spirit of adventure. He was a builder on new ground and a destroyer of old and conventional structures and inherited prejudices. He walked through obstacles as if they were not there.

In following Mr. Merrill in his high office Mr. Pierce had an equally important function—to canalize, systematize and stabilize a complicated organization that had grown too great and publicly influential much longer to flourish under the tutelage of a single adventurous and dictatorial will. Mr. Pierce's rare personal endowments, his dignity, his profound sense of justice, his natural courtesy and his inflexible will in decisions involving the ethics and public responsibilities of the Laboratories, guided the big ship out of what appeared to be increasingly menacing white waters into the placid stream of steady and strifeless progress. One wonders how this transformation could have been more skillfully achieved at the hands of any other. When the important element of timing is considered, the stone which Mr. Pierce's life and labors fitted into the Laboratories' foundation seems the one at the moment most necessary for the equilibrium of the present structure.

The new and third president, Mr. A. R. Small, for some years vice-president of the Laboratories in New York, while differing strikingly in personality and temperament from both of his unusually able predecessors, has already demonstrated the possession of qualities equally distinguished. To him also we gratefully acknowledge a long and generous service of a very high order to the N.F.P.A. His years of masterly conduct of the exceedingly complicated and difficult portfolio of our electrical committee have brought us a

sufficient reflection of his endowments of mental clarity, dynamic force and purposeful endurance and enterprise. The Laboratories are indeed fortunate to have available within the organization a man of the fine qualities and abilities of Mr. Small. Under his dynamic guidance the big organization may be entering upon a new creative era. We warmly assure him of such help and coöperation as his old fire prevention friends and associates may render to him in the assumption of his very great responsibilities.

* * * * * *

Fire Record of the Chicago Exposition. The Century of Progress Exposition in Chicago, which closed on October 31 after a second successful season unique in the history of world's fairs and exposition, had a truly remarkable fire record. The buildings were largely of combustible construction, areas were very large, valuable exhibit material, much of it combustible, was concentrated in structures with no fire cut-offs, the exposition grounds were not quickly accessible to the Chicago Fire Department. A description of the Exposition appeared in the April, 1933, QUARTERLY with editorial comment calling attention to the serious character of the hazard.

It was obvious to any fire protection engineer that once a fire had progressed beyond the incipient stage a very large loss was probable. The only hope for fire safety, therefore, lay in fire prevention and in organization and equipment for the very prompt detection and extinguishment of any incipient fire. The results of the two years of operation of the Exposition show how well this was done under the able guidance of Mr. John A. Neale, Chief Engineer of the Chicago Board of Underwriters, who serves as chairman of two important N.F.P.A. committees. Mr. Neale's slumbers were probably disturbed by the thought of the fire possibilities inherent in such a group of combustible buildings and exhibits, but the fire protection plans carried out as a result of the advice given when Mr. Neale was called in a consulting capacity are remarkable testimony to the effectiveness of the measures employed.

During the two years of operation of the fair, 177 alarms were recorded, including both manual alarms and those transmitted by the extensive automatic fire alarm system. Due to the good training of the personnel and the prompt response of Chief J. C. McDonnell, who was in charge of the Exposition fire department, only two of these extended beyond the size that could be handled by extinguishers or other first aid fire appliances. The total fire loss recorded throughout the period of the Exposition amounted to only $2500, 80% of which was accounted for by a single fire in the Ford industrial barn on August 9, 1934. Not included in the $2500 total was damage to a spectroscope machine which caught fire in the General Motors Building in June, 1933. In this case the outbreak was confined to its point of origin with no damage to the building. An alarm was transmitted automatically and the

Century of Progress fire department was on the way three minutes before a manual alarm was operated by an eyewitness.

Rigid fire prevention regulations and frequent inspections contributed largely to the reduction of the hazard and tended to offset the added danger due to the presence of enormous crowds of people in the "carnival" frame of mind among highly combustible structures. On the closing day of the Exposition, when this hazard was considered particularly acute, men with fire extinguishers were kept on duty continuously at certain danger spots.

While the record of the Century of Progress Exposition is eloquent testimony to the value of organization for fire prevention and prompt handling of incipient fires, the experienced fire protection engineer still believes that it is unsafe to rely solely on such methods and hopes that whenever another exposition is held the buildings will be constructed with a higher degree of fire resistance, and automatic sprinklers will be liberally provided to protect combustible contents.

* * * * * *

What About the Taxpayer? It is more or less obvious that this and the succeeding few years will witness a loud and insistent demand from the municipal taxpayer for economy in municipal government. The spotlight will be turned on the budgets of all city departments. The fire department has always been and will continue to be an expensive city department. It is one of the major budget items in any city administration.

The administrators of municipal fire departments must be prepared to defend their expenditures and to demonstrate very clearly that adequate service is being rendered for money received from the taxpayers. It is our general feeling that fire department administrators are on the whole not now so prepared and that a much more comprehensive and careful scrutiny of fire department expenditures should be made than has been made in most municipalities.

There should be no cause for alarm in the situation which appears to be ahead. It is sad but true that the majority of the fire departments, particularly in the smaller cities, have never had adequate man power and equipment, and have always been faced with a constant struggle to build their department to a reasonably proper and efficient force. No intelligent city administrator or budget critic will begrudge the necessary tax money for reasonable fire, police and health department service. A better understanding of the fire department budget by the taxpayer generally will be desirable as in the well-run fire department such a study will bring out the low cost of fire prevention inspection work, the low cost of salvage and the low cost of fire department training. A better understanding of the problems and functions of the fire department would be a wholesome thing for all citizens.

Let us turn from generalization to a specific example of the need for more thorough study of the fire department budget. Let us take the question of the maintenance department of two comparable large cities. The City of Baltimore has a population of 814,000. The fire department consists of 96 companies operating from 70 stations. The City of Boston, with a population of 805,000, has a fire department consisting of 84 companies operating out of 62 stations. According to 1932 figures the Baltimore Fire Department, Maintenance Division, employed 27 men, while the 1933 figures show that the Maintenance Division of the Boston Fire Department employed 123 men, or a little over five times the number of men per fire department company for maintenance. It does not seem credible that Boston, with less fire department companies and less buildings to maintain, should require 96 more employees to carry on maintenance work than Baltimore requires.

It is just such situations as this that the enlightened and militant taxpayer of the present day is going to challenge. Fire department administrators should be prepared with facts and figures to meet that challenge.

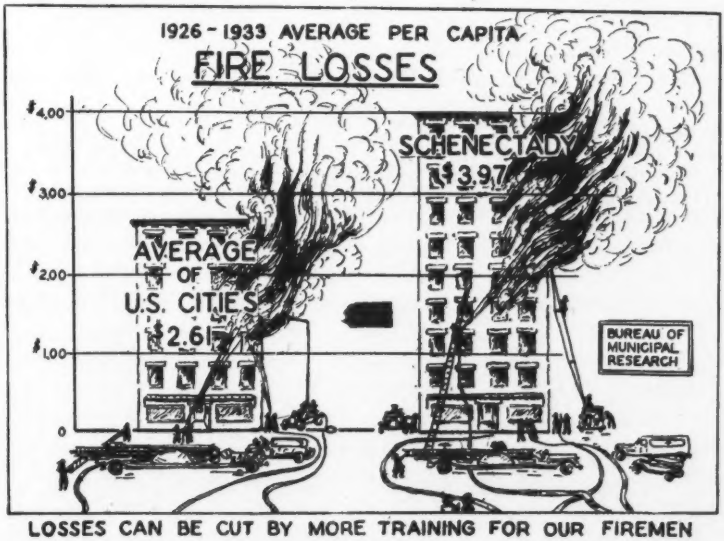
* * * * * *

Tax Exemptions for Fire Safety. Taxpayers are vociferous in their protests against various forms of taxation, but little attention seems to have been given to the incidence of municipal assessments for public fire protection. While moves have been made in various cities to reduce the amount of expenditure for municipal fire protection, unfortunately in some instances without proper regard to public safety, the gross injustice of the present method of assessment of fire department costs has largely been overlooked.

With public fire protection costs assessed as a part of the regular city taxes based upon the valuation of individual property, the owner of the modern fire-resistive sprinkler equipped building, which commonly has a high valuation, pays heavily for fire protection for which he has little need, while the owner of the frame fire-trap, which has a low valuation, contributes a relatively insignificant amount towards fire department support, although such buildings are responsible for most of the work of the fire department. A far more logical method of apportioning public fire protection costs would be to make assessments on the basis of the amount of combustible material. Thus a fire-resistive building with non-combustible contents would pay a negligible fire department tax, while the highly combustible structure would pay its just share of fire department costs. A method of taxation such as this would be a powerful incentive for the demolition of fire-trap buildings, for improved building construction and for automatic sprinklers and other private fire protection. It should eventually lead to the reduction of the fire hazards of the entire community to the point where less costly public fire protection would be adequate.

This idea might be put into effect without departing from the time-honored method of basing assessments on property values, by partial tax exemptions for property which makes little or no demand on public fire protection facilities. The fire protection tax would be handled as an item separate from the ordinary municipal budget. Ordinary frame buildings and combustible contents would be taxed on their full assessed value. Completely fire-resistive buildings meeting building code standards would have, say, 80% of their value exempted from the fire protection tax. Combustible contents, even though in fire-resistive buildings, would be taxed at their full value, but where protected by automatic sprinklers would have a large fraction of their value exempted. Land would pay only a reasonable proportion of the fire protection tax appropriate for grass and brush fires and fires in parked automobiles. No great refinement or complicated schedule would be necessary to put this plan into effect.

Research Bureau's Graph of City's Fire Losses



This cartoon from the Schenectady, N. Y., "Gazette" of December 13, 1934, is a striking way to call public attention to an unfavorable fire loss record. The graph was released by the Schenectady Bureau of Municipal Research following a conference with one of the N.F.P.A. engineers who visited the city early in December.

The 1934 U. S. Fire Loss.

The preliminary estimate of the fire loss of the United States for the year 1934 is $276,756,181. This is based on estimates by the National Board of Fire Underwriters for the eleven months ending November 30, 1934, with a figure for December based upon loss experience for the same month in previous years, adjusted for the trend of the current year. While the total estimate is approximately $41,000,000 less than 1933 and represents the lowest annual loss recorded since 1916, fire protection engineers generally feel that the current low loss figures are of limited significance in any appraisal of national fire conditions.

Although a decrease in fire losses is a logical result of conditions of the depression period, as well as the cumulative effect of fire prevention effort extending over a long period of years, the extent of the decrease in these figures seems too large to account for in this way. Fortuitous circumstances may have played a larger part in the apparent decrease in the fire loss than has been commonly assumed. There is, furthermore, a question as to whether, under present conditions, estimates based upon loss payments by the insurance companies reporting to the National Board of Fire Underwriters, with a fixed percentage added to cover uninsured and unreported losses, are properly

Comparative Monthly Loss Estimates, 1932, 1933, and 1934.

	1932	1933	1934
January	$39,224,783	$35,547,565	$28,002,583
February	39,824,622	36,661,481	31,443,484
March	49,189,124	35,321,248	31,312,359
April	43,822,233	27,825,970	22,028,943
May	39,270,524	24,338,714	25,271,459
June	34,338,670	21,578,609	20,005,692
July	32,982,434	20,004,049	19,484,027
August	31,425,931	23,626,505	19,613,146
September	30,972,318	20,447,571	16,243,870
October	30,734,458	21,465,382	18,236,272
November	31,167,708	22,454,200	20,114,346
Total 11 months	$402,952,805	$289,271,294	$251,756,181
December	39,190,506	27,626,439	25,000,000*
Total 12 months	$442,143,311	$316,897,733	$276,756,181
Adjusted loss figures. (Released later in year.)	$406,885,959	$269,778,480	

*December figure is taken as an average of the losses for the previous years adjusted for the 1934 trend. It may be noted that the final adjusted loss figure for 1933 is less than the preliminary loss figure for 1934. It may fairly be assumed, therefore, that the adjusted loss figure for 1934 may also be lower than the preliminary estimate. This assumption is supported by the fact that with the exception of the month of May, the monthly losses in 1934 were substantially less than the corresponding months of 1933.

comparable with similar figures for previous years, owing to the generally admitted fact that this insurance covers a smaller percentage of the total burnable values than formerly.

The present figures unmistakably indicate a downward trend in fire losses during the past two years and should be a source of gratification to all those interested in fire prevention and fire protection. Nevertheless, it seems the part of wisdom to suspend judgment as to the exact extent of the decrease until later figures are available, when conclusions may be drawn on the basis of average figures over a period of years rather than attempt to reach conclusions on a record of one or two years only.

Aggregate Loss for Eighteen Years Approximates Eight Billion Dollars.

The 1934 fire loss brings the total fire waste of the United States during the past nineteen years up to the stupendous sum of $8,171,033,229, an annual average of approximately 430 million dollars. The following table gives the annual fire losses by years since 1916.

1916	$258,377,952	1926	$561,980,751
1917	289,535,050	1927	472,933,969
1918	353,878,876	1928	464,607,102
1919	320,540,399	1929	459,445,778
1920	447,886,677	1930	501,980,624
1921	495,406,012	1931	451,643,866
1922	506,541,001	1932	406,885,959
1923	535,372,782	1933	269,778,480†
1924	549,062,124	1934 (Est.)	276,756,181
1925	559,418,184		

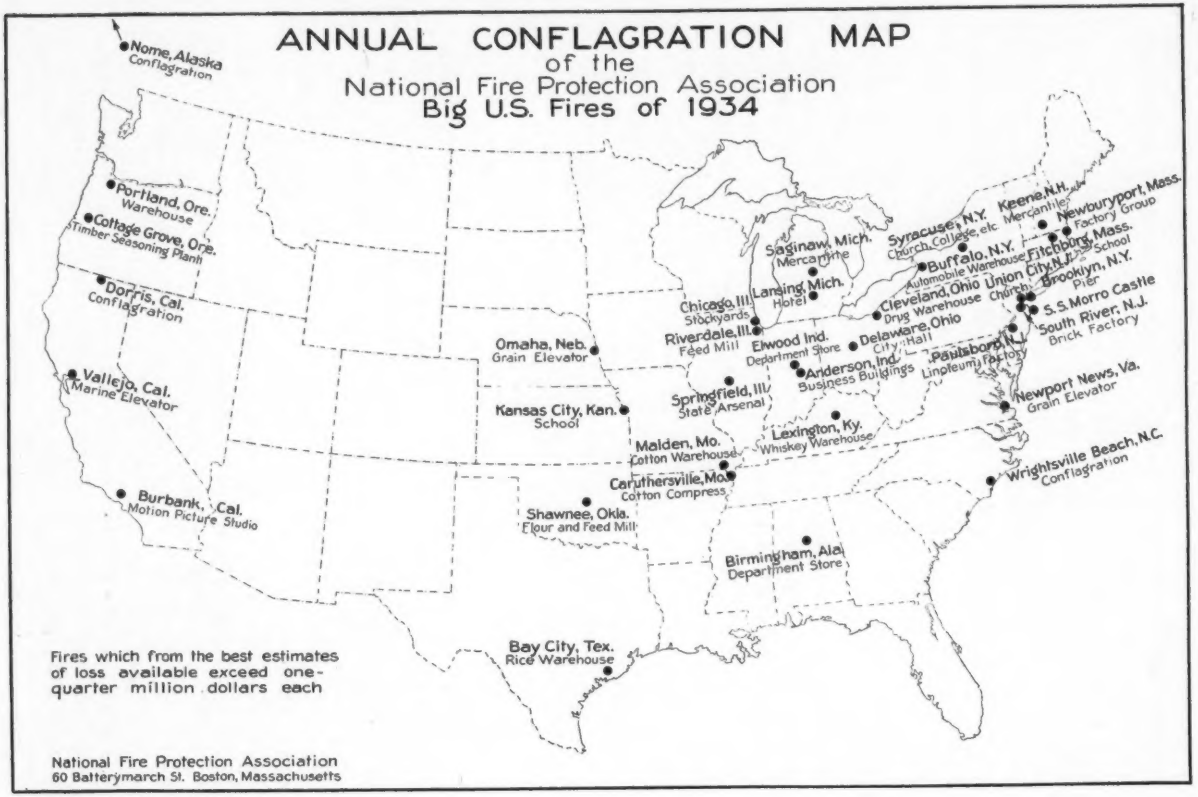
Large Loss Fires, 1934.

During the year 1934 there were thirty-four fires involving a loss reported as $250,000 or over, an increase of twelve over the previous year. These fires occurred in various sections of the United States, but the greatest number were in the central and mid-western states. The location of these fires is shown on the accompanying map.

Of the large loss fires in 1934, five were serious group fires or conflagrations. The first of these occurred on January 28 at Wrightsville Beach, N. C., near Wilmington. One hundred and three buildings, largely frame boarding houses and cottages, were destroyed. Inadequate fire protection, lack of water, and closely built frame construction were factors permitting the rapid spread of the fire. The initial spread of the fire was due to embers falling upon the wooden shingle roof of a large frame hotel; from thence it spread by radiated heat and flying brands to adjoining structures. The total loss was $550,000.

The second conflagration recorded, occurred early on the morning of May 19 at Newburyport, Mass. This fire, starting while part of the fire department

†A final adjusted figure for 1933 will be published in the April 1935 QUARTERLY.


ANNUAL CONFLAGRATION MAP
of the
National Fire Protection Association
Big U.S. Fires of 1934
Nome, Alaska
Conflagration
Portland, Ore.
Warehouse
Cottage Grove, Ore.
Timber Seasoning Plant
Dorris, Cal.
Conflagration
Vallejo, Cal.
Marine Elevator
Burbank, Cal.
Motion Picture Studio
Omaha, Neb.
Grain Elevator
Kansas City, Kan.
School
Chicago, Ill.
Stockyards
Riverdale, Ill.
Feed Mill
Saginaw, Mich.
Mercantile
Lansing, Mich.
Hotel
Elwood Ind.
Department Store
Anderson, Ind.
Business Buildings
Springfield, Ill.
State Arsenal
Malden, Mo.
Cotton Warehouse
Caruthersville, Mo.
Cotton Compress
Shawnee, Okla.
Flour and Feed Mill
Bay City, Tex.
Rice Warehouse
Birmingham, Ala.
Department Store
Lexington, Ky.
Whiskey Warehouse
Syracuse, N.Y.
Church, College, etc.
Buffalo, N.Y.
Automobile Warehouse
Cleveland, Ohio
Drug Warehouse
Union City, N.J.
Church
Delaware, Ohio
City Hall
Paulsboro, N.J.
Linoleum Factory
Keene, N.H.
Mercantile
Newburyport, Mass.
Factory Group
Fitchburg, Mass.
School
Brooklyn, N.Y.
Pier
S.S. Morro Castle
South River, N.J.
Brick Factory
Newport News, Va.
Grain Elevator
Wrightsville Beach, N.C.
Conflagration
Fires which from the best estimates of loss available exceed one-quarter million dollars each
National Fire Protection Association
60 Batterymarch St. Boston, Massachusetts

was engaged at another fire, gained considerable headway in a four-story large area vacant frame factory prior to the sounding of an alarm. The fire spread across a 100-foot open space to a four-story brick-joisted sprinklered factory building. The water supply to the sprinklers was impaired by the draft made on the mains by fire department pumpers, and this building with twenty-seven near-by structures was destroyed. Nine others were damaged. Flying brands and sparks were carried over the southern section of the city, resulting in 37 fires on wooden shingle roofs and five on awnings. The loss was approximately $400,000.

Later on the same day the largest conflagration of the year swept a large section of the Union Stockyards and adjacent buildings in Chicago. A detailed account of this fire was published in the QUARTERLY, Vol. 28, No. 1, July, 1934. The total loss in this fire was $4,617,280.

The fourth fire in this group occurred on July 28 at Dorris, Cal., when a box factory was destroyed and flying brands ignited fifty dwellings and other buildings in the town. The loss was estimated at $276,416. The final conflagration of the year destroyed a portion of the city of Nome, Alaska, on September 17. Closely built light frame construction, inadequate fire protection and limited water supplies were important factors in this loss. Reports of the loss in this fire have been contradictory, but it seems probable that it was in excess of $750,000.

The *Morro Castle* fire, described in the October, 1934, QUARTERLY, involved the largest loss of life in any single fire during the year and property loss of over $4,000,000. This is shown on the accompanying map but is not included in the tabulations.

There were a number of fires involving single buildings or properties where the reported loss was $500,000 or more. A tabulation of these losses follows:

January 29, 1934. Anderson, Ind. Store and office building	$573,000
February 8, 1934. Paulsboro, N. J. Linoleum factory	1,050,000
February 18, 1934. Springfield, Ill. State arsenal	1,000,000
March 11, 1934. Birmingham, Ala. Department store	1,500,000
April 28, 1934. Lexington, Ky. Whiskey warehouses	2,655,467
May 3, 1934. Brooklyn, N. Y. Pier	914,874
May 31, 1934. Union City, N. J. Church	532,600
June 3, 1934. South River, N. J. Brick plant	1,500,000
November 8, 1934. Newport News, Va. Grain elevator	595,342
November 23, 1934. Omaha, Nebr. Grain elevator	500,000*
December 15, 1934. Fitchburg, Mass. High School	750,000

The occupancies involved show a predominance of the "miscellaneous" class, with manufacturing and grain handling plants as a group forming a close second.

*Estimated.

National Fire Protection Association
60 Batterymarch St. Boston, Massachusetts

Occupancy			No. of Fires	Estimated Loss
Mercantile establishments			7	$3,504,272
Wholesale	3	$880,272		
Retail	4	2,624,000		
Manufacturing plants			5	3,376,398
Grain elevators, flour and feed mills			5	1,975,000*
Miscellaneous occupancies			13	8,292,535
Cotton compress or warehouses	2	$801,785		
Whiskey warehouse	1	2,655,467		
Piers and wharves	1	914,874		
Church (one with college attached)	2	842,600		
Public schools	2	955,809		
City hall	1	250,000		
State arsenal	1	1,000,000		
Automobile storage warehouse	1	264,000		
Hotel	1	308,000		
Motion picture studio	1	300,000*		
Conflagrations			4	6,593,696*
Total			34	$23,741,901

An analysis has been made of the reports of these thirty-four fires to determine the factors that have been responsible for the large loss. Not all large losses can be attributed to one factor, and in some instances as many as four or five factors have been responsible for the extensive spread and large damage caused by a single fire. A typical example is the fire which destroyed a store and office building at Anderson, Ind., on January 29. The reason for this large loss was reported as follows: (1) headway of fire when discovered, (2) rapid spread of fire to upper portions of building through unprotected vertical openings, (3) severe weather conditions, (4) lack of exposure protection for valuable telephone equipment. (See QUARTERLY, April, 1934.)

The factor most frequently responsible for large loss fires during the year was "inferior construction." Perhaps outstanding in this class was the blaze which destroyed a warehouse containing 393 new automobiles at Buffalo, N. Y., on August 5. The building involved in this fire was a frame ironclad structure, one story high and 1400 feet long, without fire walls or cut-offs. In this case the value of the building had been entirely written off, but the loss to the automobiles stored therein was $262,000. Such a building was obviously unsuited for the storage of large quantities of valuable contents of any sort. In other cases exterior walls were of brick, but the interior was decidedly inferior as far as fire resistance was concerned.

Another principal factor was "headway of fire when discovered." This factor was present in half of the fires, and it is obvious that fire departments,

*In four instances final adjusted loss figures were not available and estimates believed to be reasonably correct have been used. These were grain elevator fires at Omaha, and Vallejo, Cal., the Nome conflagration, and the motion picture studio fire at Burbank, Cal.

no matter how efficient, cannot overcome the handicap of delayed discovery. In consideration of this factor an analysis of the day of the week and time of day when these fires occurred is interesting. It is significant that of the thirty-four large loss fires, nineteen occurred in the period from 6 P.M. to 6 A.M., and nearly half of the fires occurred on Saturdays or Sundays, when business activity was suspended. In only ten cases did the fires occur during normal working hours.

Delayed alarms were also an important factor in the large loss fires. An example of this, illustrating several factors contributing to delay, was the fire which destroyed a large milling plant at Shawnee, Okla., on August 11. Employees fought the fire with private equipment until they found it had spread beyond their control and then attempted to telephone an alarm to the fire department. Being unfamiliar with the operation of the telephone switchboard, further delay resulted, and an alarm was finally sounded by an outsider while an employee was running to the fire station.

The other factors listed in the table are self-explanatory and might have been guarded against by adequate preparation and forethought.

The factors indicated by the reports as being responsible for the large losses of 1934 are summarized below. It is obvious from the totals that in most instances more than a single factor was involved.

Reasons for Large Loss.

	No. of Fires
Inferior construction	20
Headway of fire when discovered	17
Delayed alarm	12
Highly combustible contents or excessive amounts of burnable materials	12
Lack of adequate private protection	12
Lack of adequate public protection	9
Unprotected vertical openings	9
Unfavorable weather conditions	7
Point of origin of fire difficult of access	7
Fire inaccessible to hose streams — 4	
Cellar fire difficult of access — 3	
Ineffective fire fighting	6
Inefficient fire fighting — 3	
Fire department delayed in getting to work — 2	
Failure of private protection — 1	
Inadequate water supplies	6
Lack of exposure protection	5
Large area frame construction	5
Large quantities of flammable liquids	3
Dust explosions	3
Susceptibility of product to water damage	2
Delayed operation of fire doors	1

Most of the large loss fires occurred within the jurisdiction of municipal fire departments. The following table indicates how they were handled.

	No. of Fires
City fire department alone	12
City fire department and outside aid	8
Volunteer fire department with outside aid	4
Volunteer fire department alone	3
Volunteer fire department, outside aid, automatic sprinklers, private hose streams	1
City fire department, outside aid, automatic and outside sprinklers	1
City fire department, outside aid, private fire brigade	1
City fire department and automatic sprinklers	1
City fire department and railroad tugs	1
No data	2
Total	34

Only one fire in Canada has been reported as involving a loss in excess of $250,000 in 1934, as compared to six in 1933 and seven in 1932. The one fire was that which destroyed a large lumber yard containing approximately thirty million feet of lumber, together with company buildings, at Dalton, Ont., on July 9. The loss in this fire was reported as $480,000. There was little or no fire protection available.

Fire Protection in Iceland.

By Hjalmar Fugelli.

The island of Iceland is situated in the North Atlantic Ocean close to the Arctic Circle. It is a treeless island about the same size as the State of Kentucky, having an area of approximately 39,700 square miles. Only the parts along the coast are inhabited, as the interior consists of mountainous plateaus with peaks up to 6500 feet in height, deserts, extensive lava fields and glaciers. The island is studded with volcanoes, active and extinct, and hot springs. Earthquakes are frequent.

The inhabitants are mostly descendants of the old Norwegian vikings who immigrated between 871 and 950 A.D. They have their own language which has maintained its purity, as in Eddas and Sagas, for a thousand years. Politically the country is an independent kingdom united with the Kingdom of Denmark. In June, 1930, the people of Iceland celebrated the thousandth anniversary of the Althing, the oldest parliamentary assembly in the world. Over 30,000 persons took part in this celebration, including 4000 visitors.

NOTE: This article is based upon a personal survey of conditions in Iceland by the author, who is a fire protection engineer in Oslo, Norway. A few years ago he spent some months studying fire conditions in the United States, at which time he had several conferences with the N.F.P.A. Executive Office staff. Thus his appraisal of conditions in Iceland is based upon a background of knowledge of American as well as European practice in fire protection—Ed.

General view of Akureyri, one of the more important of the twenty-seven small cities located along the coast. The barren mountainous plateau shown in the background is typical of the interior of the island.

The total population of the kingdom is approximately 110,000. The capital city is Reykjavik, having a population of about 32,000. Another 30,000 people live in twenty-seven smaller townships situated along the coast, the so-called "authorized trading places," the largest of which has a population of but 4000. The leading industries are fishing and sheep raising, although farming is carried on to supply local consumption.

Iceland has evolved strange social customs and traditions. It is admitted to have attained approximately absolute justice of the sterner sort, and in its constitutional monarchy to have developed an excellent democracy. Iceland has neither army nor navy, nor fortifications; no deficit and no unemployment. And last, as many people believe, the polar bear is not kept as a pet animal. It does not even exist in the country.

Structural Conditions.

In spite of the fact that practically no trees grow upon the island and all lumber must be imported, until recently wood was used almost exclusively for building material in the cities and towns along the coast. In former days the timber supply was largely driftwood carried by the Gulf Stream from South America. Thus one finds in the primitive implements of Icelandic farmers of long ago woods like mahogany.

In the country districts a type of building known as "torfbaer" is found to some extent. The "torfbaer" is built of earth, stone and peat with interior finish and outside end walls of wood. These structures are very snug and

The village of Hnifsdalur, which hugs the shore at the base of steep cliffs, is a typical community of about 300 people. Most of the houses are metal clad with corrugated iron roofs.

are more comfortable in cold and stormy weather than some of the more modern buildings.

For protection against severe weather most frame buildings in both the city and country districts are covered with corrugated iron. In some instances slate has been similarly employed. From a fire prevention standpoint this tends to reduce the conflagration hazard by holding a fire within the building of origin. Experience has shown that usually the interior of a building practically burns out before the structure collapses, the fire being confined by the corrugated iron walls and roofs. Nevertheless, in Reykjavik and some of the other larger places the conflagration hazard is considerable where frame buildings, two or three stories high, are closely built.

During recent years concrete has come into favor as a building material. Not only the exterior walls, but also floors and sometimes roofs, are made of this material. While desirable from a fire prevention standpoint these structures have not proven entirely satisfactory, particularly in the country. The matter of insulation has not always been given sufficient attention and compared with the older "torfbaer" the concrete buildings are often bitterly cold. When, as is the case in many places, the only fuel is dried sheep dung, or expensive fuel brought on horseback from the coast, the matter of heat insulation is of vital importance.

Internal hazards are much the same as would be found elsewhere. Stoves and furnaces, however, are often primitive and chimneys of sheet iron or clay tile are rather common. This is reflected in the statistics of fire losses.

Corrugated iron covered roofs and walls in Isafjördur.

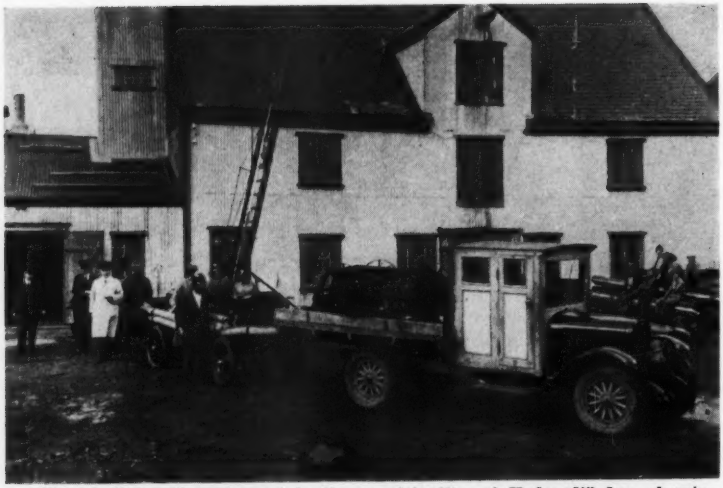
Fire Prevention Legislation.

As early as 1839 a law was passed for the city of Reykjavik, appointing a Committee on Buildings whose function was to supervise the construction of buildings, and to provide for structures which would not create a severe fire hazard. At the same time the width of the city streets was increased.

In 1875 a fire prevention ordinance was adopted which prescribed rules for the construction of furnaces and chimneys and required that chimneys be swept periodically. The ordinance also contained rules for the storage of flammable liquids, powder and explosives and provided for the control of dangerous workshops. The Fire Prevention Committee was required to exercise special surveillance over churches and places of public assembly and every building was required to have its own fire extinguishing equipment in addition to that provided by the municipality. In 1903 a building code was adopted which, with revisions, is still in effect.

Outside of Reykjavik little was provided in the way of fire protection or fire prevention until the passage of the Fire Prevention Law in 1907. This law, applying to nearly the entire kingdom outside of Reykjavik, provides specific requirements for distances between buildings, construction of furnaces, open fires, sweeping of chimneys, storage of flammable liquids, etc. Inspectors, appointed by the various city councils, must inspect all chimneys and furnaces at least once each year. The law also requires municipalities to establish civil fire brigades and provide fire fighting equipment.

In the rural districts measures were taken as early as 1905 to improve conditions relating to fire protection, when the government ordered the or-



Fire station and equipment in the municipality of Hafnarfjördur, showing typical outfit provided in the smaller coastal cities and towns. Hose is carried on the truck with the cab, while a motor pump is provided as the first trailer, with additional hose in a second trailer.

ganization of local mutual fire insurance associations and required compulsory insurance of buildings. An interesting provision in these laws reads:

> "If stoves, chimneys and furnaces are not properly maintained according to the rules given and not repaired within the time allowed by the local council, the insured loses his right to indemnification if fire occurs unless it can be proven with certainty that improper maintenance cannot be blamed for the fire."

In 1915 the Icelandic government founded a mutual fire insurance company, the Brunabótafélag 'Islands, to insure buildings in cities except Reykjavik. The company later expanded its operations to include rural areas and now also writes insurance on furniture and fixtures. The company is guaranteed by the State and is directly under the jurisdiction of the Department of Labor.

As a result of the experience of this company an investigation was made in 1928 of fire prevention and fire protection conditions of the twenty-seven small cities, which work was carried out under the supervision of the author. The results were disappointing and brought out the fact that not only did the present regulations exist on paper only, but they were entirely obsolete. The majority of the cities were virtually without adequate protection in case of fire.

Typical of conditions found was that of one of the larger municipalities which claimed to have a public water works for fire protection purposes. This

was found to consist of two small cisterns with a combined capacity of about 11,750 gallons. The equipment consisted of a single waterpost, and the pressure in the lower part of the residential district was 10 lbs. per square inch.

The cause of unsatisfactory conditions of this sort was found to be the lack of proper supervision and accordingly the Althing in 1929 provided for the appointment of a Special Fire Commissioner whose decisions should be the final word in the "practical operation and formal disposition of fire prevention and extinction matter."

Fire Protection.

The report on fire protection conditions in the twenty-seven cities inspected showed that eleven were without organized fire departments. In four cities where fire departments were provided the equipment was of no value and of the remaining twelve which had some equipment, only two or three could be said to maintain it in reasonably proper order.

As only a few of the cities had waterworks of any value for fire protection purposes, and the cost involved prohibited the construction of new ones, it was decided to base the new equipment on motor pumps.* Two sizes were selected, one of 240 gallons-per-minute capacity at 85 lbs. pump pressure, and one of 370 gallons-per-minute capacity at similar pressure.

Up to the present time eighteen of these motor pumps have been placed in service, three of the larger municipalities have acquired automobile pumps and some of them motor ladder trucks. Fire alarm sirens have been installed in most of the cities which have purchased fire fighting equipment, small fire station buildings have been erected and miscellaneous equipment, such as hose, tarpaulins, smoke masks, etc., has been supplied. As far as possible all equipment has been standardized.

Of the many difficulties encountered in planning fire protection for the smaller cities, one might be mentioned. The city of Vestmannaeyjar is situated on an island off the southern coast and is without fresh water supplies except for rain. Fortunately rainfall is frequent and water for domestic use is collected in small cisterns. During dry spells, however, water must be brought by motorboat from the mainland, two hours distant.

The cistern system was obviously inadequate for fire protection purposes and the distance from the ocean (in some cases more than 2000 feet) and the rise therefrom were too great for effective streams. Accordingly a sea water basin was constructed (in connection with a fish washing establishment) on a hill within the city and supplied by motor pumps. From this basin pipes lead to different parts of the city with suitable outlets for pumper suction.

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*In European countries a "motor pump" is a gasoline motor-driven pump of small capacity used as a trailer or drawn by hand. Pumpers similar to the motor pumps of the United States and Canada are known as automobile pumps.—Ed.

Interest in better fire protection has grown rapidly and large values have already been saved by the new equipment. The results obtained have led Brunabótafélag 'Islands to attempt to extend protection to rural communities of 300 inhabitants or less scattered throughout the island. The financial part offered some difficulties, but a scheme, acceptable to the government, was worked out and the protection of smaller places is now under way.

During recent years improvement has not been in equipment alone, but has embraced other phases of fire prevention. The Special Fire Commissioner has compiled model fire prevention regulations for the cities and, what is still more important, has resumed the work for a revision of the Fire Prevention Law to bring it into line.

Gasoline Stove Fire in Restaurant.

Employers Pioneer.

The above picture shows a fatal fire which occurred in Gardner, Mass., on September 28, 1934. It was taken by an engineer of the Employers Fire Insurance Co., who was visiting an agent when he noticed smoke coming from the building. He hurried into a near-by drug store, borrowed a camera, bought a film and took the picture before the arrival of the fire department.

The fire started in a restaurant kitchen, either from an explosion or from the overturning of a gasoline stove used for cooking. The cook was trapped by the flames in the kitchen but, her clothes burned off, she managed to reach the street. She died later in a hospital. The fire was under control in half an hour, although not until considerable damage had been done.

The picture clearly shows the tremendous impetus given to a fire in its early stages, even where comparatively small amounts of flammable liquids are involved. It points out the need for proper regulations restricting the use of gasoline and similar flammable liquids in ordinary occupancies.

Kerns Hotel Fire, Lansing, Michigan.

Early on the morning of December 11, 1934, a fire destroyed the Hotel Kerns, Lansing, Michigan, resulting in the loss of thirty-two lives. Owing to combustible interior construction and open stairways the fire spread with great rapidity as soon as it extended from the room of origin. There was no fire alarm system in the hotel and many of the guests were not aroused in time to make their escape by the stairs or fire escapes, which were well distributed around the building.

Construction and Occupancy.

The building was of ordinary brick and wood-joisted construction, originally erected in 1908 and added to from time to time until 1919. It was mainly four stories in height with a basement under the front and south wings and a low attic. Exterior walls were of brick and interior walls, except a fire wall in the north section, were of wooden construction. A five-story section on the northeast was separated from the main building by a brick fire wall, with openings protected by single tin-clad fire doors.

There were four open stairways; one from the basement to the first floor in the south wing, one from the first to the fourth floor from the lobby, one from the second to the fourth floor in the northwest section, and one from the second to the third floor in the northeast section. Two elevators in the lobby section were enclosed by metal lath and plaster on wood studding, except that the enclosure for the passenger elevator was an 8-inch brick shaft from the second to the fourth floors. Four steel fire escapes led from the corridors.

The heating boiler was in a cut-off fire-resistive one-story section with openings protected by fire doors. The banquet hall had brick walls and an incombustible roof. Part of the basement of the main building was occupied by the hotel for employees' sleeping quarters, storage of furniture, etc., while in the basements under the mercantile occupancies was a small machine shop and storeroom. The first floor was occupied principally by the hotel lobby and offices, cafeteria, kitchen, dining room, banquet hall, laundry, bakery and minor mercantile occupancies. The second, third and fourth floors were occupied for sleeping quarters.

Fire Protection.

First aid protection consisted of fifteen hand extinguishers. There were two standpipes with outlets in the basement and on each floor. There were telephones in most guest rooms. There was no watchman service, only a night clerk, bellboy and scrubman being on duty from midnight to 6 A.M. Of these

This report has been abstracted from a report furnished by Mr. Sam Robinson, Assistant State Fire Marshal, based on a preliminary investigation made by three deputies from his office.

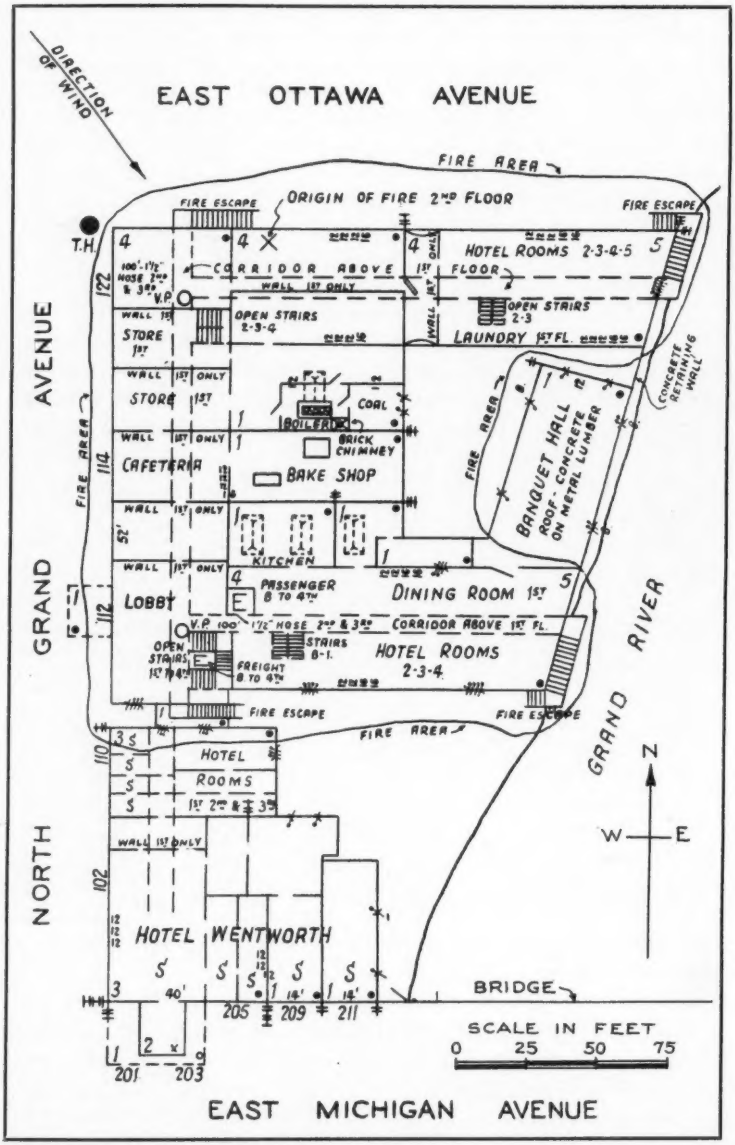


Diagram of the Hotel Kerns, Lansing, Michigan, in which 32 persons lost their lives on December 11, 1934. Fire alarm boxes, not shown in this diagram, were at North Grand Avenue and East Ottawa Avenue, and at North Grand and East Michigan Avenues.

The burning Hotel Kerns approximately one-half hour after the arrival of the fire department. This picture was taken on the Grand Avenue side of the building, the fallen wall being approximately the location of the entrance and lobby.

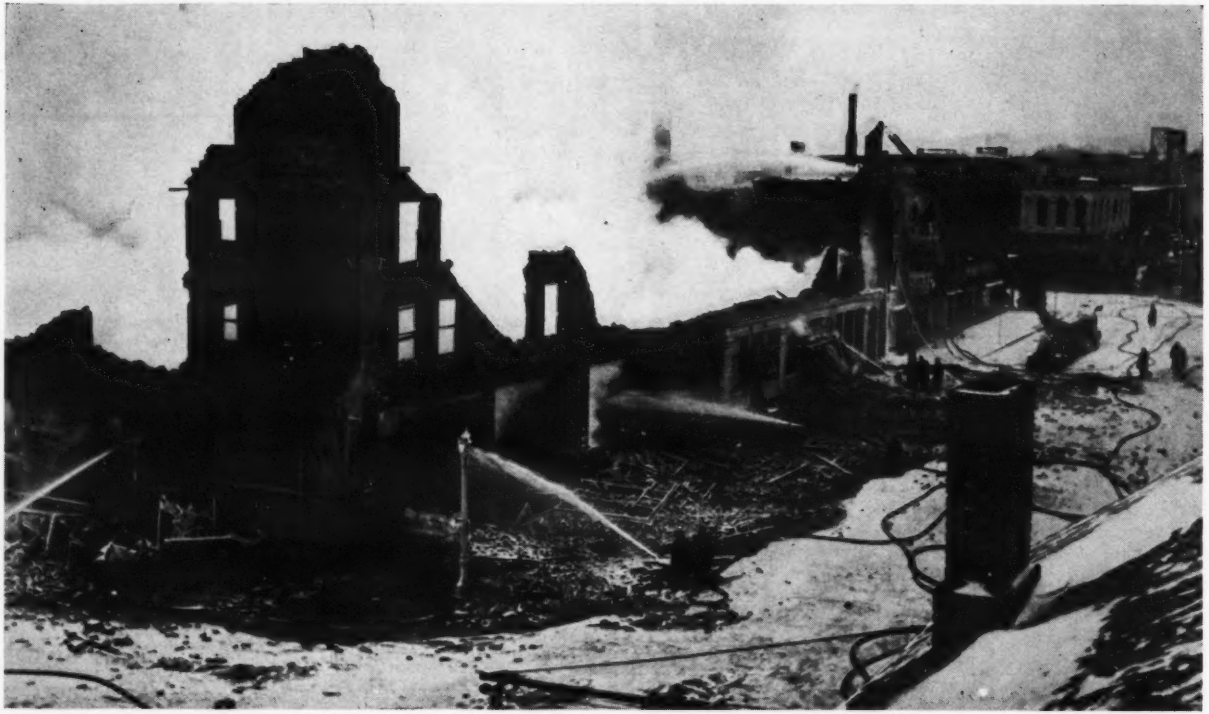
employees, the bellboy was the only one who would have occasion to visit the upper floors, and then only on call. It is said that there were no fire drills or instructions to employees relative to fires. Two city fire alarm boxes were within 250 feet of the building. Eight fire hydrants were available on 6- and 8-inch circulating mains with cross connections to 16- and 24-inch feeder mains.

The Lansing Fire Department has a fire force of 97 men (total personnel 106), with eight pumpers, an aerial truck and two city service trucks. Fire department headquarters was within 750 feet of the hotel.

Story of the Fire.

The fire originated in Room 134, on the second floor on the Ottawa Avenue side of the hotel, at the location shown on the diagram. The cause is not definitely known but is believed to have been due to the careless disposition of a lighted cigarette or match.

A guest, who had just gone to his room on the third floor, telephoned the night clerk about 5:15 A.M., stating that there was an odor of smoke in the hallway. The bellboy, one of the three employees on duty, was sent in answer to the call and finally traced the source of the smoke to the room over the one in which, it was later established, the fire originated. Awakening the occupant of this room, the bellboy entered and after some investigation found smoke



International.

View of Hotel Kerns looking along Grand Avenue, showing complete destruction of the building. Little remains but smoldering ruins. The adjoining Hotel Wentworth, on whose roof the aerial ladder rests, was saved by the presence of a solid brick wall erected as a "spite" wall a short time prior to the fire.

seeping up through the floor from the room below. The bellboy then descended to the second floor by means of the stairs, where he noted considerable smoke in the corridor and observed smoke and flames coming from the transom of the room occupied by the hotel manager. One of the guests in the north wing of the hotel also saw flames issuing from the transom of this same room about 5:25 A.M., and an employee coming to work along Ottawa Avenue at about the same time noticed flames at the outside window.

After the bellboy had made an unsuccessful attempt to arouse the occupant of the room adjoining the one in which the fire was burning, whom he knew to be the brother of the manager, he went down the lobby stairs to the office and told the night clerk there appeared to be a serious fire. It seems probable that the alarm was sent in by telephone at this time, which alarm was received by the fire department at 5:30 A.M.

According to the testimony presented at the investigation, Evans, the bellboy, after reporting the fire to the night clerk, returned to the scene of the fire and found it had gained considerable headway. He succeeded this time in arousing the manager's brother, the occupant of room 132, and together they attempted to enter the burning room by means of a pass-key, but were unsuccessful. After consuming at least ten minutes (Evans' estimate) in this attempt, Evans went into that part of the hotel east of the fire doors and aroused guests on three floors by shouting and knocking upon their doors. He left the hotel by way of the fire escape at the east end of the north wing. According to Evans' statement that was his entire activity insofar as arousing guests is concerned.

In order for Evans to walk from room 134 to the hotel office and return, it was necessary for him to use the corridor on the second floor twice. Evans stated that although he knew guests were sleeping in all the rooms opening upon this corridor, he made no attempt to arouse these guests. When questioned relative to this he stated, "No, I didn't make any attempt because I didn't have a thought of only Dave and Doug,* because that is where all the fire was, and it came to me later that if I had had any head I would have notified them, but I didn't. I just thought of getting those two out because that is where all the fire was."

The fire department made a quick response, but before a hose line could be laid and water put on the fire, many of the windows on the street sides of the building had been raised and the occupants of the rooms were calling for help. The means of escape for many had been cut off by fire and smoke. A general alarm was sent in at 5:35 A.M. to which additional companies responded. All firemen then at the scene of the fire devoted their efforts to the saving of lives with aerial, extension and straight side ladders, and a life net. Aside from those saved by firemen, many escaped by means of the lobby

*The manager and his brother, occupying rooms 134 and 132 respectively.

View of Hotel Kerns looking along Grand Avenue, showing complete destruction of the ... ruins. The adjoining Hotel Wentworth, on whose roof the aerial ladder rests, was saved by the presence of a solid brick wall erected as a "spite" wall a short time prior to the fire.

stairs through the office, or by the fire escapes. Others, due to panic or driven by smoke or flames, jumped to the sidewalk, to roofs of one-story buildings at the rear, or into the river. As near as can be determined, the rescue work by firemen lasted about twenty minutes, at which time the roof and floors collapsed and the walls fell. The fire was under control at about 7:30 A.M., but it was not until the morning of the next day that the ruins had cooled sufficiently to conduct a search for those who had perished.

Fire Department Operations.

The telephone alarm, as shown by fire department records, was received at 5:30 A.M., and the regular response to the district answered, consisting of twenty men (including an assistant chief and his driver), two engines, an aerial and a service truck located at three stations within one mile. At 5:32 A.M., after apparatus had left headquarters, a box alarm was received from the corner of Grand Avenue and Ottawa Avenue. Upon arriving at the scene of the fire the first engine company connected to the hydrant at the northwest corner of the building, but before water could be turned on the assistant chief saw the necessity for rescue work rather than the extinguishment of the fire. At 5:35 A.M., shortly after his arrival, he sent in a general alarm which brought a response of twenty additional men with four more engines. The chief and other assistant chief were called shortly after the original telephone alarm was received. The off shift was also called, and although some thirty-two men responded, probably only a few of them arrived in time to assist in the rescue work.

During the period of rescue the aerial truck operated along the front of the building on Grand Avenue, and the service truck was stationed on Ottawa Avenue. Ladders were used on the south, west and north sides of the building as well as in the areaway at the rear; the river on the east made rescue impossible on that side. Several persons were saved with the life net at the front and south sides. In extinguishing the fire fifteen hose lines were laid, six on the south side, six on the Grand Avenue side (two of which were supplying the ladder pipe on the aerial), and three on the Ottawa Avenue side. The eight pieces of apparatus were in service from 1½ to 12 hours, with an average operation of eight hours. An engine which had not been previously called was placed in service in the afternoon and this crew worked for 16 hours. Calls for assistance were sent out, and apparatus from Jackson and Owosso responded, standing-by at headquarters.

Weather.

According to the United States Weather Bureau the temperature at 5:30 A.M., December 11, 1934, was 1° Fahrenheit, with the wind from the northwest at a velocity of eight miles per hour, and about two inches of snow on the ground.

Acme.

Rear view of the hotel, showing fire escape in south wing by which many persons made their escape. This picture was taken after the north wing had collapsed. Note police in boat searching for bodies in the river.

Loss of Life.

The hotel had 211 rooms, and although the register was destroyed in the fire it is estimated that on this night there were 215 guests and 35 employees in the building.

The total loss of life reported up to December 28 was thirty-two; of this total, fourteen were recorded as having died in hospitals or in attempting to escape at the time of fire. Eighteen bodies, of which six remain unidentified, are reported as having been taken from the ruins. There were twenty-four persons seriously injured or burned who were taken to hospitals. In addition, there were a number of minor injuries which were treated elsewhere. While the location of the bodies found in the ruins was not confined to any one section of the hotel, the greatest number were found near the origin of the fire and the least number in the section east of the fire wall.

Property Loss.

The hotel and contents were valued at approximately $250,000. According to latest information available, the insurance to be paid on the buildings amounts to $156,000 and on the contents $35,294. Mr. Wm. G. Kerns, the owner, made his home in the building and suffered a loss estimated between $5000 and $10,000. In addition to the foregoing, losses of varying amounts were suffered by five mercantile establishments which occupied space in the hotel building. Damage by fire and water amounting to $5000 was also done to the Hotel Wentworth adjoining.

There is an interesting story in connection with the saving of the Hotel Wentworth, which is directly south of the Hotel Kerns. For a number of years the two hotels were run as a single unit under one management. Several years ago, however, because of a disagreement, the lease was discontinued and the Wentworth was again opened as a separate establishment. There is said to have been some ill feeling over the deal, as a result of which a solid brick fire wall was built between the two buildings. This wall, while not primarily intended as a fire cut-off, was responsible for preventing the spread of the fire to the Wentworth, although some fire got over the top of the wall into the building.

Conclusions.

1. The lack of automatic sprinkler protection and the necessity for watchman service, private fire alarm, fire drills and instructions in a hotel building of this size and type of construction are forcibly illustrated.

2. Had the fire alarm been sent in promptly, the loss of life probably would have been considerably reduced.

3. In a fire of this nature the man power of the average city fire department is insufficient. While there was no lack of apparatus and the water supply was adequate, had there been more trained men available additional lives could, no doubt, have been saved.

4. The fire and police department of the City of Lansing are to be commended for the excellent service rendered under the existing conditions.

Fire Prevention Week at KNX, Los Angeles.

The principal feature of the fire prevention week campaign in Los Angeles centered around radio station KNX, and was the result of a plan worked out by Chief R. J. Scott of the Los Angeles Fire Department and the staff of the radio station. This plan provided for a regulation punch register, fire alarm gong and siren installed in the announcer's booth at KNX. By means of this equipment all calls received by fire alarm headquarters were transmitted to the broadcasting station, where microphones retransmitted the alarms to the radio audience.

The effect was impressive. Programs were interrupted by the alarms, the bell and siren warnings crashing out even in the middle of announcements. Inspector O. J. Emory of the fire department was on duty at KNX throughout the station's broadcasting hours the entire week. After each alarm he went on the air, interpreting the warnings. He gave the location and character of the

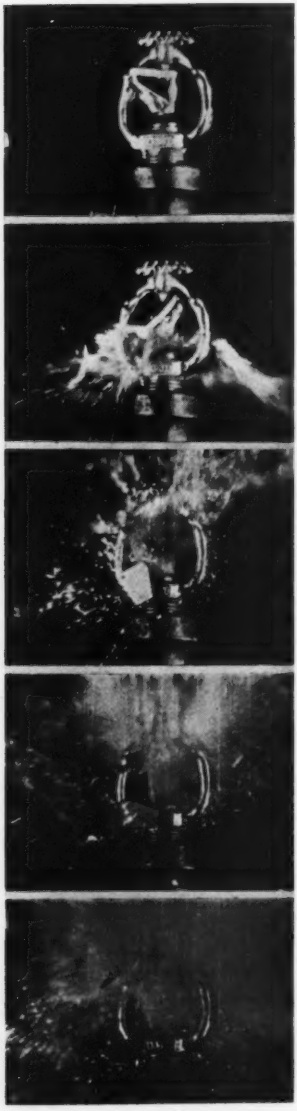
fire, the number of companies and types of apparatus attending, and followed each report with significant statistics on fires during the past season.

KNX is a 50,000-watt station, serving eleven western states, Canada and Alaska. Thus these messages of fire prevention reached millions of listeners during Fire Prevention Week. It was a real thrill for radio fans to hear the sudden alarms and be told their significance. The fire prevention lesson was taught by the statistics broadcast over the air by Inspector Emory.

There were second alarm fires, brush fires, grass fires, factory fires, fireboat calls and major responses. Nearly eighty calls of every type and description were handled during the six days of the campaign. Officials proclaimed the Fire Department-KNX stunt the most successful innovation of the Week.

Broadcasting station KNX, Los Angeles, showing Fire Prevention Week program in operation. All alarms were received over regulation fire department punch register and gong and retransmitted to the radio audience through the microphones. Inspector Emory is seen here interpreting an alarm as it comes in.

How a Sprinkler Head Operates.



The accompanying photographs of a typical sprinkler head in operation show exactly what happens from the actuation of the head by heat until the water is flowing in full stream from the nozzle against the deflector and thence on to the fire.

These motion pictures were taken at the rate of 192 frames per second. Alternate frames are reproduced here, representing a time interval of one ninety-sixth of a second between pictures, and an elapsed time of about a twentieth of a second from the time the solder begins to melt until water is released on to the fire.

The first picture shows the head just as heat was applied and the solder started to flow. The next shows the collapse of the strut and the start of the flow of water from the nozzle. In the third, the strut and other metal members may be seen falling and the water from the nozzle is shooting upward toward the deflector.

The fourth picture shows the water from the nozzle striking the deflector in full force, and the final picture shows the even distribution of the water from the deflector on to the fire below. These pictures show conclusively the practically instantaneous operation of a typical sprinkler head as soon as the heat is sufficient to melt the solder.

(C) Rockwood Sprinkler Co.

Hong Kong Gas Holder Explosion.

On May 14, 1934, an illuminating gas holder owned by the Hong Kong and China Gas Company, and located in a thickly settled district of the city of Hong Kong, suddenly collapsed and an explosion followed. The resultant fire communicated to near-by tenement houses, causing loss of life to forty-two person and injuries to many others. The property loss was considerable.

Construction and Maintenance.

The gas holder involved in the explosion was put into use during the early part of 1910. It was specially designed to withstand the climatic conditions in Hong Kong. The guide framing and internal bracing are said to have been of greater strength than required by standard practice. It had a capacity of 500,000 cubic feet of gas, and at the time of its collapse on May 14, 1934, contained about 350,000 cubic feet. Since installation the holder had given no trouble and it is said to have been well maintained.

The holder floated on the gas distribution system and was connected thereto by two mains, one in and one out, the valves of which were always open. This operation of a holder is automatic and requires no particular attention. Should operating difficulties arise, it would be apparent at once from gauges, which were said to be under constant supervision of the exhauster attendant.

Due to climatic conditions in Hong Kong, where there may be long periods without rain, it was considered desirable for the European engineer to inspect the holder at frequent intervals, primarily to ascertain that the water seals of the holder were filled to the necessary depth. This was accomplished by a weekly inspection which also included an inspection of the guide wheels and sheeting. Any repairs necessary were entered in the Repairs Book and any leaks would be repaired by patching in accordance with the standard practice of the gas industry. The patching was done with small plates, bolted out, while temporary repairs could be made with paper. As the holder was considered safe, it was thought that it required little other attention, and therefore no survey, either external or internal, was deemed necessary unless it behaved abnormally.

The only repairs that this holder had required during the last two and a half years were made in October, 1933, when old patches were removed and new ones put on, and a few small leaks remedied. The holder has always been kept well painted, the last painting being done early in 1933.

Note: This report is condensed from data furnished by Mr. L. H. Gourley, American Consul at Hong Kong, Chief J. Gordon Dyson (Member N.F.P.A.) of the Shanghai Fire Brigade, and Chief H. T. Brooks of the Hong Kong Fire Brigade.—Ed.

General view of explosion area in Hong Kong. At the left may be seen the frame of the gasometer responsible for the disaster (the gasometer telescoped down). At the right are the burning tenement houses in Clarence Terrace. Note that the damaged houses were level with the gasometer when the latter was at its full height.

The gas company asserted that there is always a certain amount of corrosion in gas holders, as some oxygen is present in the water and, to a small degree, in the gas. Experience has shown that this corrosion is not generally a serious matter, and gas holders are usually constructed to withstand their maximum pressure (allowing for any corrosion) after a reasonable period of something like forty years.

It was further stated that it is possible to check up on internal corrosion without an internal examination of the tank. In practice, however, such an inspection is made only when absolutely essential. It is a difficult and dangerous procedure to those engaged in the operation because of the difficulty of clearing the holder of gas, and it is said that there have been several fatalities while this kind of inspection has been carried out. Furthermore, the holder has to be put out of commission during the examination, which involves considerable expense and inconvenience.

Story of the Explosion and Fire.

The collapse occurred without warning shortly before 11 A.M. on May 14, 1934. Immediately the escaping gas ignited and flames, driven by a stiff wind from the harbor, communicated to a row of four-story tenement houses across the street. The very suddenness of the disaster, coupled with the intense heat and flame, cut off the escape of the occupants of the tenement houses involved, and it was at this point the greatest loss of life occurred.

Following the initial blast confusion reigned as the wind-blown flames raced up the stairways and through the windows of the doomed structures. A considerable number of the victims were found on the open verandas of the upper floors of the Clarendon Terrace tenement houses, where they had rushed on hearing the explosion. Others were trapped in stairways and hallways as they sought to escape, or were injured by jumping. It was stated by eyewitnesses that the intensity of the fire was sufficient to consume the clothing of the victims almost instantly, leaving the bodies in an almost roasted condition. Corpses burned beyond recognition were picked up yards away from the terrace, while living victims, pitifully mutilated, were rushed to hospitals.

The total loss of life in the fire was forty-two, of whom twenty died in hospitals. In view of the situation it is remarkable that as many persons survived long enough to reach a hospital before succumbing to their burns or other injuries. Forty-six others were seriously injured and were given treatment at hospitals. Among those who died in a hospital was the Indian watchman of the gas company, who was in a hut next to the gas container when the explosion occurred.

Despite the prompt arrival of the fire brigade, the fire spread in other directions, presumably from radiated heat, and soon a number of other buildings (chiefly dwellings) were ignited and severely damaged.

Inquiry into Cause of Disaster.

An inquiry into the cause of the disaster was commenced on June 5 and concluded on July 5 after holding seventeen hearings. Numerous expert witnesses were called and gave evidence, and the gas company and certain owners of damaged property were properly represented. The coroner's jury consisted of three distinterested parties, one of whom was an American citizen.

In expressing their verdict the jury stated that, in their opinion, the original cause of the disaster was an escape of gas from the holder due to the failure of the side sheeting from corrosion. The jury stated it to be their opinion that ignition was caused by sparks incident to the tearing of the plates as the gasometer collapsed. They also believed that there was later a minor explosion in the watchman's hut.

The jury further stated that, from evidence placed before them, they were satisfied that the gas holder was originally erected and subsequently maintained in accordance with the general practice of gas engineering. This practice, however, they were advised by expert witnesses, presages the life of a holder at 40 to 50 years without material examination. This may be satisfactory in temperate climates and where holders are reasonably isolated, permitting the safe dispersal of any leakage. The jury suggested that in semi-tropical places like Hong Kong steps should be taken to set a higher standard of internal maintenance, especially including periodical internal examination.

Fatal Tank Truck Accident.

Report by Arizona Equitable Rating Office.

(Member N.F.P.A.)

Highway "US 60" enters Wickenburg, Arizona, from the southwest on Second Avenue and crosses the railroad tracks on a down grade, resulting in a rather bumpy crossing. Just beyond the tracks the street ends and the highway turns to the right. At this point is a row of buildings facing the railroad, consisting of two adobe lodgings and four frame structures.

On November 27, 1934, at 6 A.M., a large tank truck and trailer carrying 6200 gallons of gasoline entered town along Second Avenue, crossed the railroad tracks and failed to make the turn on the other side. The truck and its trailer crashed into one of the adobe lodging houses, instantly killing two persons who were occupying a front room. The tanks were ruptured by the crash and fire resulted which destroyed the building, together with two frame structures adjoining. A rider on the truck was burned to death.

The regular driver of the truck had been en route from Indio, his last rest stop, approximately twelve hours. He had picked up a hitch-hiker and allowed the latter to drive the truck so that he, the driver, might get a little rest. This was, of course, in violation of the company's rules. It was probably the temporary driver's inexperience with the truck he was driving, together with the rough crossing and sharp turn, which constituted the principal factors responsible for the accident.

Keystone.

Fire Record of Lumber Yards.

The concentration of large values within a single fire area is characteristic of the storage of lumber in both wholesale and retail lumber yards.* Highly combustible and readily ignitable, the average lumber yard obviously presents a potential fire hazard, but this hazard may be reduced to a minimum by proper supervision, good housekeeping and maintenance.

In congested sections of cities, lumber yards present a serious exposure and conflagration menace, creating a demand upon the municipal fire and water departments in excess of normal fire protection requirements. In smaller communities, with limited water supplies and fire fighting equipment, lumber yards may present a hazard beyond the ability of existing fire protection facilities to handle. Unless a fire is discovered immediately after its start and attacked in its incipiency, the probability of serious loss is great.

These conditions are being remedied in many communities, however, for modern building codes limit the quantity of lumber which may be stored under one roof without fire walls between storage areas, and require storage buildings having brick walls in place of the old style open frame sheds. Zoning laws limit the area of yards and indicate where they may be located. Thus the tendency today is for smaller and better arranged yards with improved types of sheds and other buildings located in suburban areas away from congested centers.

National statistics relative to lumber yard fires and losses for recent years are not available, but the following data covering several states, compiled from figures obtained from the U. S. Census of 1929 and reports of the various State Fire Marshals, are presented as indicative of the relative frequency of lumber yard fires. The distribution of losses and their relation to values involved will be shown by typical examples elsewhere in this record.

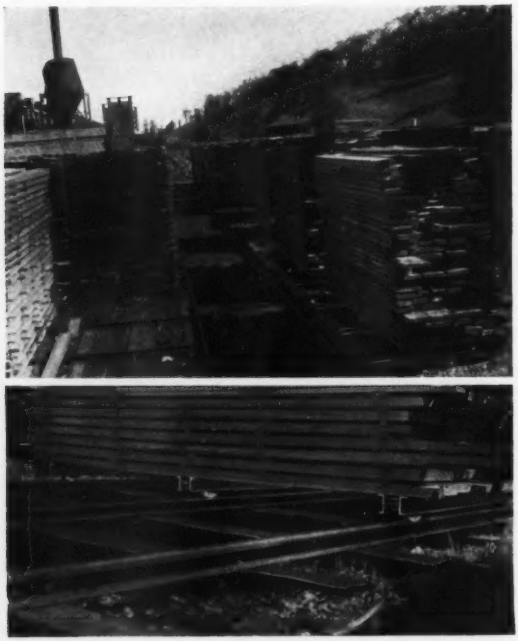
State	Total Establishments	Average No. of Fires Annually
Illinois	1777	22
Indiana	1000	8
Iowa	1370	9
Kansas	1107	5
Pennsylvania	1701	24†
Wisconsin	1008	7

†Exclusive of Philadelphia and Pittsburgh.

*The term "wholesale yards" is used to denote those yards at sawmills where finished lumber is stored awaiting shipment, or large distribution yards located at strategic points, acting as feeders for smaller yards. "Retail" yards are those selling direct to contractors, builders or the public in general, and the contents thereof often include builders' supplies, etc., as well as lumber.

The files of the Department of Fire Record of the National Fire Protection Association contain reports on approximately six hundred lumber yard fires which have occurred from 1907 to date. This includes all classes of retail yards ranging from large storage yards with values in excess of $500,000 to the small yards found in the smaller cities and towns. Eighty-four fires which have involved wholesale yards for the storage of finished lumber adjacent to sawmills have also been included. These reports have been carefully analyzed as to their important features and this analysis has been supplemented by data extracted from a number of State Fire Marshals' reports and reports of Fire Insurance Patrols.

Insurance inspection bureau reports are the source of data on the majority of the fires in this record, supplemented by reports based on newspaper accounts which have been verified by N.F.P.A. members. As in the case of other fire records which have appeared in the QUARTERLY, this record does not include many of the small fires which occur from time to time in lumber yard properties and are extinguished with nominal loss. In spite of this fact,



Factory Mutual Record.

In this storage yard lumber is piled on low trucks by means of which it can be rolled to the kiln and from there into the plant. This method not only eliminates rehandling and disorderliness in the yard, but provides mobility for the piles in case of fire.

A difficult lumber yard fire, in Brooklyn, N. Y. This photograph illustrates the difficulty experienced by firemen in fighting fire in lumber piles. The uneven piling of the lumber makes effective attack possible from only one direction, the end of the pile, as shown in the picture.

however, the record contains a sufficiently broad selection of typical lumber yard fires to permit a reasonable analysis of the fire experience in this class of occupancy.

Fires and Losses in Lumber Yards — 1924 to 1933 Inclusive.

(From reports of State Fire Marshals.)

Year	State of Wisconsin		State of Iowa		Province of British Columbia	
	Fires	Loss	Fires	Loss	Fires	Loss
1924	6	$41,900	12	$120,614	8	$87,163
1925	16	103,035	14	185,152	8	80,834
1926	10	9,010	8	64,435	4	21,998
1927	4	725	9	233,042	6	63,636
1928	4	1,255	10	50,815	4	3,840
1929	5	9,605	6	47,388	5	5,987
1930	4	450	9	12,466	3	69,971
1931	10	19,171	7	47,805	3	762
1932	4	3,050	7	55,904	1	2,079
1933	13	108,281	6	79,683	0	0
Total	76	$296,482	88	$897,304	42	$336,270
Av. loss per fire		$3,900		$10,197		$8,006

Considering lumber yard losses from the viewpoint of distribution between buildings, contents and stock in yards, it is apparent that under conditions of normal activity the greater proportion of the loss would be to the items of contents and stock. The distribution of losses in lumber yard properties covering a ten-year period, as compiled by the Iowa State Fire Marshal and the Philadelphia Fire Insurance Patrol, is shown in the next table.

Fireman's Fund Record.

At 5 P.M. the Feather River Lumber Mill at Oroville, Cal., was a busy plant furnishing employment for 1,100 men.

Fireman's Fund Record.

An hour later all hope had vanished of saving any part of a $2,500,000 investment. The red glare in the sky was seen from a hundred miles away. The fire started in a large area dry shed, presumably from sparks blown from a burning rubbish heap outside.

American Lumberman.

View of interior of the unsprinklered dry shed at Oroville, Cal., mill of the Feather River Lumber Co., where fire was discovered and through which the flames traveled with lightning-like rapidity. Automatic sprinklers might have held the fire in check until hose streams could have been brought into action.

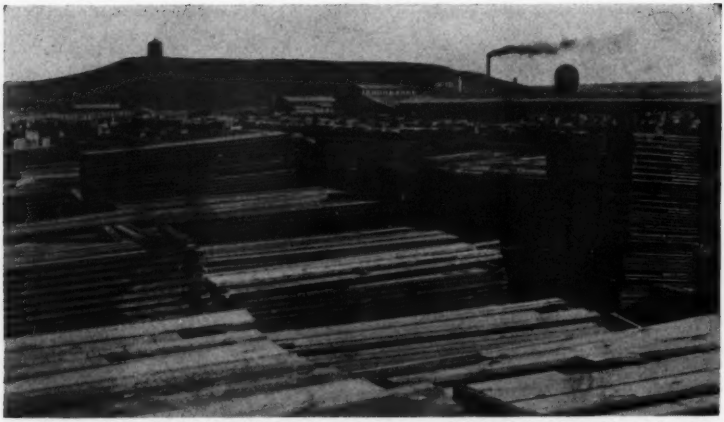
Fireman's Fund Record.

An hour later all hope had vanished of saving any part of a $2,500,000 investment. The red glare in the sky was seen from a hundred miles away. The fire started in a large area dry shed, presumably from sparks blown from a burning rubbish heap outside.

Distribution of Losses.

	State of Iowa		City of Philadelphia	
1924-1928	**Total**	**Per Cent**	**Total**	**Per Cent**
Loss buildings	$189,023	28.7	$2,486	6.5
Loss stock	465,035	71.3	36,342	93.5
Total loss.....	$654,058	100.0	$38,828	100.0
1929-1933				
Loss buildings	$89,547	36.8	$2,079	22.7
Loss stock	153,699	63.2	7,074	77.3
Total loss	$243,246	100.0	$9,143	100.0

Of the total fires in the N.F.P.A. fire record files where the loss was definitely indicated, four hundred and sixty-five, involving an aggregate loss of $29,967,779, occurred in retail yards. Forty-five fires, involving an aggregate loss of $4,110,038, were in wholesale yards, chiefly those operated in connection with sawmills. For the purposes of the table which follows, all losses classified as wholesale yard fires include *only* the loss to the lumber on the yard, regardless of whether or not the fire spread to near-by mill buildings. Losses classified as retail yards include the loss to lumber sheds and/or other structures which, as indicated by the original reports, formed an integral part of the yard.



View of yards at Oroville, Cal., showing a million dollars' worth of lumber which was destroyed, though separated from the buildings by a clear space of 195 ft. The 100,000-gal. tank, which proved a wholly inadequate water supply, may be seen on the skyline of the hill.

Analysis of Lumber Yard Losses—N.F.P.A. Records.

Character of Loss	Retail Yards	Wholesale Yards	Total Fires
Small loss (under $1000)	58	3	61
$1000 but under $10,000	56	7	63
$10,000 but under $25,000	98	5	103
$25,000 but under $50,000	95	11	106
$50,000 but under $100,000	77	12	89
$100,000 but under $250,000	54	2	56
Over $250,000	27	5	32
Moderate (no figures available)	7	1	8
Considerable (no figures available)	12	3	15
Large (no figures available)	16	28	44
No data as to loss	4	7	11
Total	504	84	588

The next table presents a more detailed analysis of 293 fires in the N.F.P.A. fire records where loss figures, broken down as to building and contents, were available. This table, unlike that which preceded, includes under the classification "wholesale yard fires" the loss to mill buildings and machinery involved as well as to the lumber in the yard adjacent thereto. In thirty-five fires involving both yards and mill structures, fourteen, entailing an aggregate loss of $3,916,118, originated in the yard and spread to buildings. Twenty-one, entailing a total loss of $2,988,865, originated in mill or kiln buildings and spread to the yard.

Milwaukee Journal.

Airplane view of lumber docks at Menominee, Michigan, showing wind-driven flames sweeping through piles of lumber, representing approximately twenty-six million feet of finished stock. The fire, of alleged incendiary origin, started in a stable on the property and destroyed a modern mill, a flooring plant and two million feet of logs in addition to the finished lumber. Due to the headway of the fire when discovered, the fire department could do but little other than to protect exposures.

Comparison of Losses — Lumber Yard Fires.

Retail Yards.

	No. Fires	Building Loss Amount	Building Loss Per Cent	Contents Loss Amount	Contents Loss Per Cent	Total Loss
Less than $10,000	62	$38,916	13.8	$180,223	86.2	$219,139
$10,000 but under $25,000	67	169,572	15.5	917,319	84.5	1,086,891
$25,000 but under $50,000	53	312,388	16.3	1,589,917	83.7	1,902,305
$50,000 but under $100,000	38	431,476	17.7	2,015,448	82.3	2,446,924
$100,000 but under $250,000	19	204,696	6.9	2,696,900	93.1	2,901,596
Over $250,000	13	185,352	2.6	6,298,239	97.4	6,483,591
Total Fires	252	$1,342,400	8.5	$13,698,046	91.5	$15,040,446

Wholesale Yard Fires.

	No. Fires	Bldg. and Mchy. Loss Amount	Bldg. and Mchy. Loss Per Cent	Stock Loss Amount	Stock Loss Per Cent	Total Loss
Less than $10,000	3	.....	...	$20.14	100.0	$2,014
$10,000 but under $25,000	3	$12,903	31.2	28,319	68.8	41,222
$25,000 but under $50,000	6	103,886	45.9	121,742	54.1	225,628
$50,000 but under $100,000	11	439,438	51.6	410,714	48.4	850,152
$100,000 but under $250,000	13	1,076,169	43.2	1,423,837	56.8	2,500,006
Over $250,000	5	1,792,941	49.8	1,812,837	50.2	3,605,778
Total Fires	41	$3,425,337	47.2	$3,799,463	52.8	$7,224,800

Concentration of powerful hose streams from pumpers and fireboats prevented the spread of this fire from the lumber shed where it started to the adjoining yard and near-by wharves. As it was, the loss was estimated in the vicinity of $200,000.

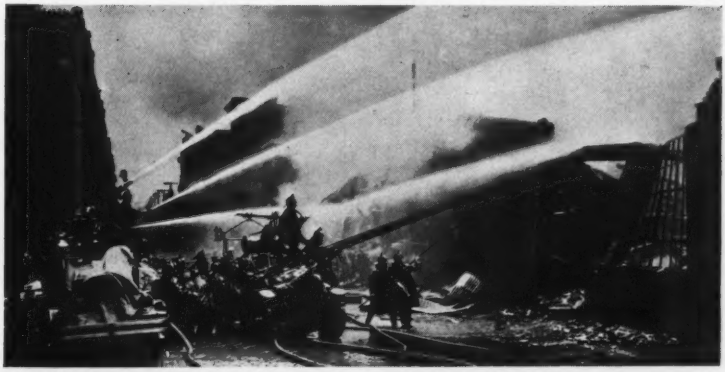
The relation of losses incurred to values involved in two typical states is shown by statistics furnished by the Fire Marshals' Department of the States of Winconsin and Indiana.

Lumber Yard Fires and Losses — Wisconsin.

Year	No. of Fires	Values Involved	Loss	Loss per Fire
1924	6	$375,700	$41,900	$6,960
1925	16	354,230	103,035	6,450
1926	10	2,811,550	9,010	901
1927	4	95,750	725	181
1928	4	220,920	1,255	314
1929	5	359,840	9,605	1,921
1930	4	5,250	450	112
1931	10	914,513	19,171	1,917
1932	4	230,218	3,050	762
1933	13	2,495,146	108,281	8,325
Total	76	$7,873,117	$296,482	$3,900

Lumber Yard Fires and Losses — State of Indiana.

		Buildings		Contents	
Year	No. Fires	Value	Loss	Value	Loss
1925	11	$64,524	$31,014	$76,500	$62,089
1926	3	1,000	.....	89,000	13,500
1927	No data	45,000	37,009	61,400	50,075
1928	4	25,900	1,260	20,000	5,075
1931	14	87,640	69,170	202,500	130,460
Total		$224,064	$138,453	$449,400	$261,199



International.

Lumber sheds of brick and steel construction will not prevent a serious loss when such sheds are filled with highly combustible wood products. This picture shows firemen extinguishing a fire in the property of the Balsa Wood Company in Brooklyn, N. Y.

The next tables show the causes of lumber yard fires. One has been prepared from N.F.P.A. records, while the others give similar figures for the State of Massachusetts and the City of Philadelphia. These data from widely separate sources and compiled on different bases appear, in general, to agree.

In the principal table, made up from N.F.P.A. records, the data have been classified in such a way as to bring out the difference, if any, in hazards of retail and wholesale yards. In the case of the latter class of yards all fires which originated in mill or kiln buildings and spread to the yard have been classified as exposure fires regardless of the factor primarily responsible for their origin.

Lumber Yard Fire Causes.

N.F.P.A. Records, 1907-1934.

Cause	Retail Yards		Wholesale Yards	
	Fires	Per Cent Known Causes	Fires	Per Cent Known Causes
Incendiary	71	24.4	3	4.4
Smoking—matches	54	18.5	3	4.4
Sparks from locomotive or stack	54	18.5	17	24.6
Exposure	43	14.8	42	60.8
Electrical causes	16	5.5	0	—
Spark from machinery	6	2.1	0	—
Lightning	6	2.1	1	1.4
Sparks from boiler	5	1.7	0	—
Other known causes (less than 5 fires from each)	36	12.4	3	4.4
Total known causes	291	100.0	69	99.8
Unknown—suspicious	17		0	
Unknown—no data	196		15	
Total	504		84	

W. E. Patterson.

High piling proved a severe handicap in fighting this Cleveland, Ohio, lumber yard fire. Good practice requires that piles be limited in height to fifteen feet where possible. The yard shown in this picture offered a severe hazard to the steel framework of the railroad viaduct at the left.

Causes of Lumber Yard Fires, 1924-1933.

State of Massachusetts	No. Fires
Smoking—matches	30
Sparks from bonfires, brush fires, etc.	12
Malicious mischief	10
Fireworks	7
Sparks from stacks	6
Sparks from locomotives	5
Children and matches	5
Sparks from furnaces, forges, stoves, etc.	4
Incendiary	4
Miscellaneous known causes	16
Unknown—suspicious	3
Unknown	10
Total	112

City of Philadelphia	No. Fires
Ignition of rubbish or litter	5
Sparks from chimneys	3
Smoking—matches	3
Sparks from locomotives	2
Incendiary	2
Electrical causes	1
Foul chimney	1
Unknown	27
Total	44

The N.F.P.A. table of fire causes shows a very marked predominance of incendiarism as a cause of fires in retail lumber yards. This is also indicated by statistics compiled by a large insurance company specializing on this class of risk. A lumber yard makes a spectacular fire and is attractive to pyromaniacs. Furthermore, if there is easy access to the yard (a not infrequent condition) it furnishes a convenient lodging place for transients who, all too often, may be responsible for fires therein. From a careful analysis of the

Bad housekeeping is responsible for many lumber yard fires. The accumulation of refuse shown above is just right for ignition from a stray spark or from a carelessly discarded cigarette.

original reports of these fires it seems probable that a considerable number charged to incendiarism were due to carelessness on the part of trespassers rather than deliberate incendiary motives. In Canada, labor troubles in connection with the lumber industry have been responsible for a number of large losses in wholesale lumber properties in the past few years.

Smoking takes its toll of lumber yards as well as other types of occupancies. Even though a "no smoking" rule is enforced among employees, customers frequently walk through sheds and yards and this hazard is difficult to control. The hazard is enhanced, when the yard is not enclosed, by the presence of unauthorized persons who may use the yard as a "short-cut" from one point to another. Accumulations of slash or other yard refuse create conditions favorable to the start of fires from discarded cigarettes or matches.

As many lumber yards are located along railroad tracks, there is always the hazard of locomotive sparks. If lumber dealers would determine the prevailing wind direction, and then, so far as practicable, would lay out their yards to the windward of railroad spurs, it is quite probable that their efforts would be rewarded by fewer fires. Similarly sparks from boiler house stacks and/or refuse burners contribute to the fire record of both wholesale and retail yards. Spark arresters on such stacks would help eliminate many fires from this cause. Most fires due to sparks occur in the spring or fall or during long dry periods when weeds, trash and litter in the yards may be tinder-dry and the smallest spark will cause ignition. Good housekeeping in the yard is a good preventive for this type of fire.

Factory Mutual Record.

A fire was discovered outside this Camden, N. J., lumber shed about mid-afternoon of a July day. Before hose lines could be brought into action it had reached the interior of the building, through which it spread with such rapidity that the roof collapsed within twenty minutes of the start of the fire.

Exposure accounts for a goodly proportion of the fires in the record. Lumber yards are particularly susceptible to this type of fire, particularly those where a high standard of housekeeping is not maintained, making it possible for a stray spark to find ready fuel to feed upon. To minimize the exposure hazard, lumber yards should be situated at least 100 feet (preferably 200 feet) from other buildings and should be located where wind exposure is at a minimum — provided there is any choice in the matter.

The record shows that many fires in lumber yards in built-up areas are caused by exposure. The forty-two fires in wholesale yards charged to exposure were fires which originated in mill buildings and spread from thence to the lumber storage yard.

Method of Discovery of Fire.

Complete data as to the methods of discovery of the fires in the record were not available and no attempt has been made to collate this information for mill yard fires, due to the predominance of exposure fires in the latter group. However, it has been possible to make a general summary of retail lumber yards as follows:

Method of Discovery	Time of Day of Fire		
	6 A.M. to 6 P.M.	6 P.M. to 6 A.M.	No Data
Outsiders	35	129	66
Employees or occupants	47	10	23
Watchmen	6	48	18
Sprinkler alarm	2	3	1
Automatic alarm	1	1	0
Burglar alarm	0	0	1
No data	27	35	51
Total	118	226	160

W. E. Patterson.

Cleveland firemen fighting a lumber yard fire. Lumber is ordinarily piled with crosspieces between the layers to permit free circulation of air. This facilitates drying, but at the same time creates a condition favorable to the rapid spread of fire.

Point of Origin and Spread of Fires.

	No. Fires
Originated in Yard	241
Confined to yard	167
Spread to sheds or other buildings of plant	63
Spread to other parts of plant and outside property	11
Originated in Lumber Sheds or Warehouses	181
Confined to building of origin	150
Spread to yard or other buildings of plant	21
Spread to other parts of plant and outside property	10
Originated in Mill Buildings	34
Confined to building of origin (not included in this record)	0
Spread to yard or other buildings of plant	34
Spread to other parts of plant and outside property	0
Originated in Other Buildngs of Plant*	84
Confined to building of origin	41
Spread to yard or other buildings of plant	39
Spread to other parts of plant and outside property	4
No Data as to Point of Origin of Fire	48
Total number of fires	588

*The classification "other buildings" includes office buildings, garages, material sheds, stables, etc., not primarily used for the storage of lumber but an essential part of the property.

The origin of the fires included in the record is indicated by the preceding table. This table not only shows the approximate point of origin, but also the relative seriousness of the fires as indicated by their extent.

How Fires Were Extinguished.

For the most part the lumber yard fires included in N.F.P.A. fire records were extinguished by the use of fire department hose streams. In some instances these streams were supplemented by streams from private yard hydrants supplied from public mains or by private fire pumps. A number of large wholesale yard fires were at lumber mills remote from public fire protection and these fires were fought with such private fire fighting facilities as were available.

On the whole, public protection, where adequate water supplies have been available, has proven unusually effective in numerous fires, even when the probable maximum loss was considered 100 per cent. In most of these instances, however, the fires were discovered soon after starting and an alarm was promptly given.

Automatic sprinkler installations in this class of occupancy are not numerous and such installations are generally confined to the boiler room, office and other miscellaneous buildings. The following tabulation indicates the performance of sprinklers in such fires as have been recorded.

Operation of Automatic Sprinklers.

Operation	No. of Fires
Extinguished fire	8
Held fire in check	1
Total Satisfactory	9
Sprinklers not a factor	4
Total	13

Location of Sprinklers	No. of Fires
Dry shed or kiln	3
Boiler room	3
Loading platform	2
Shed or warehouse	2
Shavings vault	1
Office	1
Mill room	1
Total	13

Some Recent School Fires.

Many school and municipal officials seem to believe that there is little or no danger of school fires and that no precautions against fire are necessary, in some instances even carrying no fire insurance on school property. Nevertheless, since the publication of the N.F.P.A. pamphlet, "School Fires," in June, 1931, approximately three hundred schoolhouse fires have been recorded by the Department of Fire Record. These bring the total number of fires in the N.F.P.A. fire record files which have occurred in school and university buildings up to 1200, only about fifty of which occurred prior to 1917.

The record is by no means complete in that it does not include many of the smaller fires which occur from time to time in school property. Figures compiled by the National Board of Fire Underwriters indicate that fires occur in school property at the average rate of five a day, and that the annual loss on school and college property in the United States alone is well over $5,000,000, if the usual allowance is made for unreported fires.

During the past six months there have been seven interesting public school fires in widely separated parts of the United States. With one exception these have involved substantial losses. Two of these fires occurred in school buildings on the Pacific Coast which were undergoing alterations to make them earthquake proof. One was the result of an exposure fire in a detached building. One occurred while school was in session, demonstrating the value of school fire drills. Three occasioned almost total losses, starting in the night and reaching an advanced stage prior to discovery. Detailed summaries of these fires follow.

Arlington, Wash., High School Fire.

July 11, 1934.

On July 11, 1934, a fire starting in the Science building of the High School, Arlington, Washington, resulted in the total destruction of this building, serious damage to the High School building, and more or less severe damage to four near-by structures.

The Arlington High School was a two-story building having exterior walls of hollow concrete blocks. Interior construction was part sub-standard mill and part ordinary joisted. A wooden shingle roof overhung the walls on all sides. The area on each floor was about 8300 square feet. All window openings were unprotected and the only windows on the rear were on the second floor above the auditorium stage.

This report, together with illustrations, was furnished by the Washington Surveying and Rating Bureau (Member N.F.P.A.).

This picture shows the Arlington, Washington, High School building shortly after it had caught fire from the adjoining Science building. Note volume of smoke from burning wooden shingle roof.

Fifteen feet east of the northeast corner of the high school building was the one-story Science building. This was an old wood-joisted structure with a wooden shingle roof and wood ceiled and sheathed interior. The Domestic Science department occupied the west end of the building with a lunch room for students. There were several electric plates and two oil stoves in this section. The Manual Training department adjoined on the east and was equipped with the usual number of electrically driven small machine tools. Wiring for electric plates and motors was in conduit, apparently a fair installation. Wiring for lighting circuits was open and sub-standard.

Several other buildings, the school bus garage, the farm shop and a small building used as a repair shop were located adjacent to the Science building and formed part of the school group. East of these structures was a group of frame dwellings, all with wood shingle roofs.

Story of the Fire.

The first notice of the fire came when a young woman on her way home to lunch noticed heavy smoke rolling from the roof of the Science building. She ran to a near-by residence and telephoned an alarm, which was received at the volunteer fire department headquarters at 12:08 P.M.

The fire department responded promptly, but by the time a hose line could be laid the Science building was a mass of flames and it seemed certain that the High School building would be involved. Two hose lines were laid, one from each of two hydrants near the building, but it was at once apparent that hydrant pressures were inadequate and the town's 500-gallon pumper was

connected to one of the hydrants. Some delay was occasioned by transferring the line from the other hydrant to the pumper, which supplied both lines for the duration of the fire. Another hydrant line was laid from the other side of the fire, the stream from which was responsible for saving the other buildings on the school property and the dwellings beyond.

When it was apparent that the Science building was beyond saving, the local department devoted its efforts to saving the High School and the dwellings near by. From the start the firemen were hampered by lack of water, and when aid arrived from Everett at 3:30 P.M. the High School was about half involved. The fire entered the High School building by means of the overhanging wood cornice and through the exposed window openings on the second floor. The Everett pumper connected to the hydrant previously abandoned by the Arlington firemen, and its two streams were helpful in saving the lower floors.

The chief and assistant chief were out of town when the first alarm was sounded and the volunteer department was under the command of a captain until the assistant chief arrived after the High School building was involved. Twenty-one volunteers reported for duty. Inquiries show that there was some lack of coördination on the part of the local fire department, which may be attributed to the absence of the chief officers at the start of the fire. There were also not enough hose streams to work with any degree of effectiveness until help from Everett arrived.

Cause and Loss.

The cause of the fire is unknown. School had been closed for about two weeks and it is stated that all waste and refuse in the manual training rooms had been burned and all paint and varnish removed from the benches. Electricity in the building was cut off when school ended, but had been turned on again by the janitor at the request of the garage mechanic. The meter had been disconnected by the power company, but the janitor says he reconnected it himself, instructing the mechanic to notify the power company, but the mechanic had forgotten to do so before the fire.

The values involved and the losses to buildings and contents (covered by insurance) were as follows:

	Value	Loss
High School	$66,241	$34,499
Science building	9,328	9,328
Other buildings and dwellings	4,100	563
Total	$79,669	$44,390

This fire is typical of small town schoolhouse fires where buildings of combustible construction, "built-to-burn," are without automatic fire protection, and where fires once started can gain rapid headway when one or more factors, such as delayed discovery of the fire, inadequate fire fighting equipment or water supplies, and/or indifferent fire fighting may be present.

San Francisco Police Dept.

Portion of damaged roof of San Francisco Girls' High School, showing effect of heat on the unprotected steel roof structure.

Girls' High School Fire, San Francisco, Cal.

August 18, 1934.

Following the earthquake in southern California in March, 1933, the State Legislature passed an act relating to the safety of design and construction of school buildings, one provision of which required that all existing school buildings be remodeled where necessary to meet certain earthquake resistance specifications. A survey of San Francisco schools disclosed that eighteen school buildings were in need of reinforcing to make them earthquake-resistive and reconstruction was accordingly undertaken.

Among the buildings upon which extensive work was under way was the Girls' High School. This was a three-story wood joisted brick building with a partial unprotected steel frame. It covered the greater part of a city block. Characteristic construction features of the building were long hallways, large open areas, suspended ceilings, absence of proper fire-resisting partitions and lack of effective fire stops, particularly in the roof space.

Story of the Fire.

The fire was discovered early on the morning of August 18, 1934, by the watchman of the construction company, and an alarm was turned in to the fire department at about 4:40 A.M. The watchman had smelled smoke some time previous and after hunting for some few minutes found himself trapped in one of the wings of the building by smoke and flame. He escaped by breaking a window on the first floor and jumping out.

When the fire department reached the scene, the flames were leaping twenty feet above the roof and one wing, which housed the auditorium, seemed

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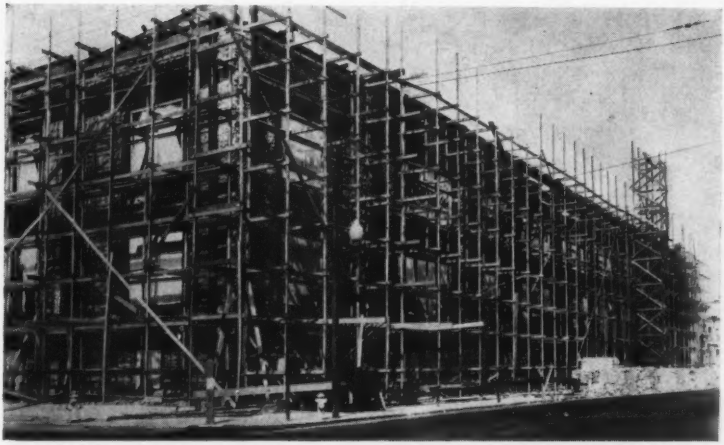
This report has been prepared from data furnished by Mr. Clarence Heller (Member N.F.P.A.), supplemented by material extracted from the *Fireman's Fund Record* and the *Pacific Coast Fire Chief*.



San Francisco Police Dept.

General view of San Francisco Girls' High School, showing scaffolding and other hindrances to fire fighting. Note how windows were blocked by boards and tar paper. The fire originated near the hoist at the left and traveled along the cornice between the new construction, old walls and new girders.

to be entirely involved. Additional alarms were sounded, bringing into service seventeen engine, five truck and several water tower companies, together with special equipment such as a rescue squad, searchlight truck, etc. The fire was fought by hose streams within the building and by streams from the water towers and hose lines outside the building.

The delayed discovery of the fire was due to the covering of the windows with boards and tar paper for protective purposes, and these same coverings, as well as the mass of scaffolding which surrounded the building on all sides, seriously handicapped fire fighting operations. Steel girders, being welded and replaced, were exposed, while tons of brick were in a position to fall as the fire and the powerful hose streams played havoc. During the height of the fire a 24-inch girder dropped to the street, tearing apart scaffolding and some of the brick work.

Cause and Loss.

The theory as to the cause of the fire is that a spark from an acetylene torch used in welding operations the previous day had dropped down through the walls, where the steel work was being completed, and ignited combustible material. In the opinion of the fire marshal, the fire had in all probability been smoldering all night.

An examination of the building after the fire indicated that the fire started in the neighborhood of the base of a hoist on the exterior of the building. The principal fire damage within the building was in the auditorium at the extreme end of the structure. From thence it traveled through the entire

roof space on the long side of the building (about 350 feet) and about one-half the width of the short frontage (about 140 feet). From the street, fire could be seen only at the top of the outer and inner walls, indicative of the course of the flames along the cornice between the new construction, old walls and new girders. Considerable damage was done by the large quantity of water necessary to subdue the fire.

The total loss to the building and contents was $180,348, fully covered by insurance. This does not include, however, the loss suffered by the contractor who was doing the reconstruction work. This latter item has been estimated in the vicinity of $20,000, making the total loss approximately $200,000.

Grade School Fire, Milwaukee, Wis.

October 22, 1934.

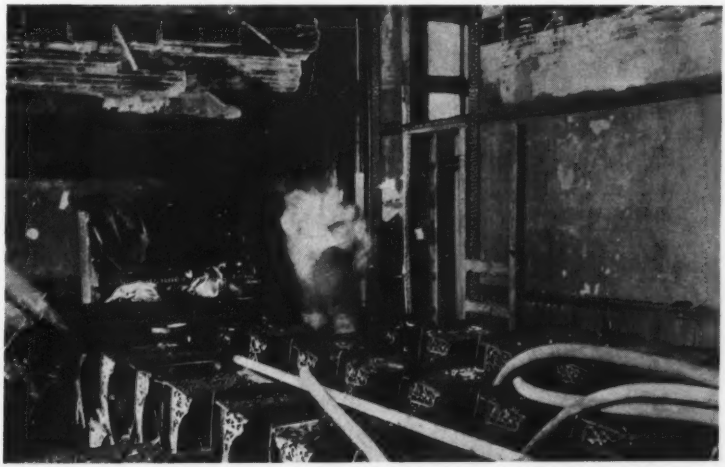
When fire swept the classrooms of the Victor Berger grade school in Milwaukee, Wis., on October 22, 1934, the value of school fire drills was clearly demonstrated. The attendance of the school is approximately 950, of whom a considerable proportion were in the building at the time of the fire. All escaped without injury.

The building in which the fire occurred is three stories in height and of ordinary brick-joisted construction. One wing was erected forty years ago and an addition thereto was built about nineteen years ago. Each floor and the basement is equipped with fire extinguishers, and the steam heating plant in the basement is cut off in a fire-resistive room. There are seven exits from the building.

The fire, which occurred at 9:59 A.M., was of incendiary origin, having been started by an eight-year-old boy who has since been placed on probation by the juvenile court authorities. This boy was a pupil in a classroom on the second floor, and when the class was dismissed for recess he stepped back into the cloakroom and threw a lighted match into a cabinet containing school supplies. Immediately after committing this act the boy proceeded to the lavatory in the basement and set fire to some rolls of toilet paper which, however, were readily extinguished and caused no damage.

In the meantime the fire upstairs reached considerable proportions due to the fact that the windows had been opened for ventilation during recess and the room was completely deserted. The fire was discovered by a teacher passing through the corridor. It is the practice in this school to release the children for recess at different intervals, segregating the upper grades from the lower, so while the room in which the fire occurred was vacant, other classes were in session throughout the building. An alarm was immediately sounded and all pupils were marched from the building to safety with perfect order and discipline.

This report was furnished by Chief Peter Steinkellner of the Milwaukee Fire Department.



Keystone.

Schoolroom in Victor Berger School, Milwaukee, where an incendiary fire occurred during school hours. Combustible trim and furnishings provided ample fuel for the fire, and wood lath and plaster walls and ceiling facilitated the spread of the fire to the floor above.

Nine engine and four ladder companies responded to the alarm and had the fire under control within fifteen minutes, but not, however, before the fire had extended to the third floor. The estimated loss to the building was $25,000 and $5000 to the contents, the greatest percentage of which was due to heat and smoke.

Lowell High School Fire, San Francisco, Cal.

November 4, 1934.

This fire was similar in character to the fire which damaged the Girls' High School in San Francisco on August 18. Like the latter building, the Lowell High School was undergoing extensive reconstruction work to make it earthquake-resistive. Both were night fires and in each the spread of the fire was directly due to the absence of proper cut-offs in the roof space.

The Lowell High School building was a large area brick-joisted building, three stories in height with a deep basement, which gave the impression of a four-story structure. It was built in 1912 at a cost of $312,000, and the present reconstruction work is being done at an additional cost of $140,000. At the time of the fire the building was completely covered with scaffolding, and other building materials were scattered about the yard, making the fire extremely difficult to fight.

This report has been prepared from data furnished by Mr. Clarence Heller (Member N.F.P.A.).

The fire was discovered in the early morning hours. It originated in a large drafting room on the top floor, spread to an adjoining room used by art classes, and then ate its way down through the floor to two classrooms below. It also spread into the roof space, where it traveled, unmolested by cut-offs, through a considerable area. Fire department officials stated that a heavy rain which fell the day preceding the fire and soaked the scaffolding prevented a much more serious fire.

The fire was fought by fire companies summoned by four alarms. A total of seventeen engine, eight truck and a water tower company were on the scene. The flames gained rapid headway despite the fact that the Twin Peaks high pressure system was brought into play. The fire department was handicapped by the fact that the valves on the building standpipes had been removed and the outlets capped, so that this private equipment could not be used. Hose lines had to be stretched all the way from the street to the roof.

The cause of the fire was not definitely ascertained, although several theories were advanced. All work requiring acetylene welding equipment had been completed on the top floor and it does not seem likely that a spark from this source was responsible. A cigarette, dropped by a workman, might have landed in combustible material to smolder and burst into flame hours later. Spontaneous ignition may have been a factor, but no definite evidence of this was advanced. There were rumors that men had been seen running from the building, but the watchman denied this, and fire department officials could find no one who had actually seen strangers emerge from the building. The loss was estimated to be in the vicinity of $65,000.

Sharon Public School, Sharon, Wis.

November 17, 1934.

Inferior construction and an overheated smoke flue were responsible for the destruction of the public school building housing both grade and high schools, in Sharon, Wisconsin, on Saturday morning, November 17, 1934. The fire, starting in the basement, gained considerable headway prior to its discovery and worked its way upward through unprotected concealed spaces to the upper floors and roof space.

The original school building, built in 1884, was of brick veneer construction two stories in height and containing nine rooms. In 1909 an addition was built thereto having solid masonry walls and interior joisted construction. When the addition was constructed the vent flue was built inside the old building, leaving the studding between it and the brick veneer. The furnaces

This report has been prepared from data furnished by Mr. Henry G. Miller of Sharon, Wis., supplemented by a newspaper account of the fire appearing in the Sharon *Reporter* of Nov. 22, 1934.

The Sharon, Wisconsin, school before the fire which resulted in its total destruction.

(hot air type) were connected to the stack by a galvanized smoke pipe about 12 feet long which, at the stack end, was only about eight inches below a lath and plaster ceiling, plaster thin and cracked.

At one time the ventilating system had outlets all around the baseboards of the schoolrooms through which cool air was drawn back to the heating room. This flow of cool air traveled through a space left under the floor made possible by laying the floor on nailing strips which were placed across the joists, leaving an opening between the floor boards and top of joists.

Story of the Fire.

The fire was discovered shortly after 6 A.M. by a passer-by. An alarm was sounded, and when the firemen arrived, within a few minutes, they found fire burning in the southwest corner of the old building, almost directly above the furnaces. Dense smoke filled the structure, making it difficult to work from the inside. In spite of this, lines were taken inside and an attempt made to direct streams on to the fire. The ceiling plates in the firing room were pulled down, but the position of the joists prevented the hose streams from reaching the seat of the fire. A hole was punched through a partition opposite the entrance, but here the firemen found their streams blocked by a brick wall which divided the old part of the structure from the new.

In the meantime the flames had worked their way up through the space between the vent stack and the brick veneer wall of the old building into the attic. There was no outside entrance to the attic. Smoke began to come through the shingles at all points, and very soon the entire upper part of the building was in flames.

But a small part of the valuable equipment of the building was saved. It was thought at first that the fire department could check the fire and little

attention was paid to the salvage of books, desks or other materials. When the firemen were finally driven from the building, after about an hour, the structure burned so rapidly that there was no time to save the contents. Four streams of water directed into the blaze had but little effect, except to save the manual training and domestic science equipment in the basement of the new addition.

The school records were stored in a large safe on the second floor. They included records of all students who had ever attended the school. Firemen were informed of the safe's location, and by keeping a stream of water playing on this spot throughout the fire managed to keep the safe cool and a portion of the floor on which it stood from burning, although most of the floor in this room collapsed.

After the fire had died down somewhat on Saturday afternoon, the school principal was able to reach the safe and found it cool enough to work on and the combination in working order. It was opened and the contents removed to a safe place. Firemen who remained at the blaze during the night report that the safe crashed into the basement about 4 o'clock Sunday morning.

The cause of this fire was charged to an overheated or defective flue. The loss was estimated at $40,000, one of the heaviest ever sustained in Sharon.

High School Fire, Fitchburg, Mass.

December 15, 1934.

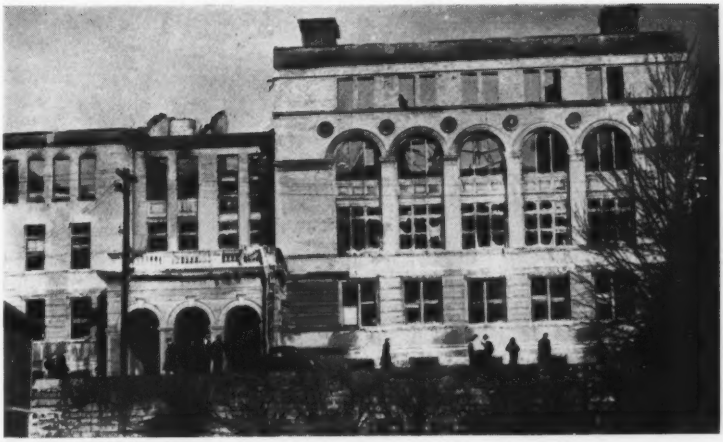
The Fitchburg Senior High School was destroyed by fire early on the morning of December 15, 1934, with a loss estimated in excess of $600,000, uninsured. One fireman was killed and two were injured while at work on the débris several hours after the building was destroyed. A school official is quoted as saying that the building was not insured because of the "unlikelihood of fire."

The building was erected in 1896. It was of brick-joisted construction with a frontage of about 300 feet, and contained approximately 46 rooms. The center portion of the building was four stories in height and the wings at either side were three stories. Due to topographical conditions the building was one story lower at the rear. There were two open stairways in each wing. The corridors on each floor extended the entire length of the structure without fire doors at the openings in the fire walls between sections. The roof was of hip type construction with numerous large skylights.

For some years the fire department had recommended automatic sprinklers in the basement and roof space but no sprinklers were installed.

On the afternoon prior to the fire the fire department was called at 5 P.M. to the high school for a supposed chimney fire. A ladder company responded

This report was prepared by Mr. P. C. Charnock, Chief Engineer, New England Insurance Exchange (Member N. F.P.A.).



Donald Barton Studio.

Ruins of Fitchburg High School, showing bare walls standing. This picture was taken from a lower level looking at the front of the building. The entrance to the building shown in the picture, was one of two leading from the street to the upper floor where the fire started.

and after fifteen minutes' examination of the building returned to quarters without detecting any fire. Sparks were said to have been coming from the chimney, which were attributed to shavings from the manual training room which were being burned in the incinerator.

Story of the Fire.

The first notification of the fire was when fire department headquarters received a call from the telephone exchange at 3:05 A.M., some person in the vicinity of the school having reported to the telephone office of hearing an explosion and stating that the High School was on fire. The fire department responded immediately, and at 3:07 A.M. an alarm was transmitted from a near-by street box by the chief's driver. This was immediately followed by a general alarm, and calls were sent to the adjoining communities of Leominster and Westminster for assistance.

The glare from the fire was visible before the fire department left the station. On the arrival of the firemen the fire seemed to be in the front of the building in the section of the upper floor occupied by the chemistry department. It had also spread through the entire length of the roof space and was bursting through the skylights. The aerial ladder was raised immediately on arrival in an attempt to direct a hose line into the windows in the chemistry room. Ladders were also raised on the front of the building at the wings, where it was planned to carry hose lines into the third floor, but before the hose lines could be carried up, the ends of the ladders started to burn and this plan of attack had to be abandoned.

Coincident with the attempt to carry lines over the ladders, the department entered the building through the two entrances at the front and also at the rear. Hose lines were carried up the two stairways, but the heat was so intense from above that the firemen were forced to retreat until finally they were driven out of the building. All attempts to combat the fire were then confined to streams directed from the street.

The fire was fought by the entire Fitchburg fire department with the exception of one hose company which "covered-in" at headquarters. The two engine, three hose and three ladder companies at the fire were assisted by two engine companies from Leominster and another from Westminster. Twenty-six hose streams in all, with a total of 8650 feet of hose, were used during the fire. Heavy stream appliances were used by Fitchburg and Leominster firemen.

The water supply was reported as being adequate, except that direct hose streams from two small mains in the vicinity were not effective. Good streams were furnished by the two Fitchburg pumpers and the three from outside. Direct hose streams from a 12-inch main a block away were satisfactory.

Cause and Loss.

The cause of the fire has not been determined. The fire started on the upper floor in the vicinity of the chemistry room or in the roof space.

The city carried no insurance on any municipal property. It is said the building originally cost about $300,000, and it is claimed the replacement cost would be at least $600,000. There is some salvage remaining in the structure, although it is estimated the loss will be about 90% on the building. No figure is available as to the value of the contents, but it is estimated that the loss thereon will be in the vicinity of $150,000.

The exterior walls of the building are all standing with the exception of the middle portion of the rear wall. The third and fourth floors were entirely burned, and the middle portion of the rear, which contained the assembly hall, is burned out to the basement.

High School Fire, Abington, Mass.

December 18, 1934.

The final fire in this series of schoolhouse fires occurred at 3:30 A.M. on December 18, 1934, and resulted in severe damage to the Abington High School at Abington, Mass. The building involved in the fire was three stories in height, of brick-joisted construction with a slate roof.

First information that a fire was in progress came from a citizen whose home was located nearly a mile from the school. He noticed a red glare on the sky and telephoned the fire department, which responded promptly. When the firemen arrived, the fire, which appears to have originated in the chemistry laboratory, had involved the entire upper part of the southeast wing of the building.

Anthony Cabrel.

The Abington, Mass., High School after the fire was brought under control. The fire department, handicapped by inadequate water supplies, did good work in preventing a total loss. Automatic sprinkler protection would probably have held the fire at the point of origin.

The firemen endeavored to check the fire in the corner of the building where it had its inception, but the wooden interior burned like tinder and a fresh breeze gave added impetus to the flames. Several firemen under the command of the chief entered the upper portion of the building by way of a fire escape in an effort to fight the flames at close quarters in the laboratory. They had been in the building but a few moments when they discovered the smoke and fire were so thick that they would have to retreat. As they worked back to the fire escape they found that their only means of escape had been cut off by the rapidly spreading fire. They shouted to their companions below, who raised a ladder and assisted the trapped men to the ground.

The Rockland fire department was called to assist the Abington firemen at the fire, while Whitman firemen covered in at Abington stations and a company from Weymouth covered in at Rockland. The Abington and Rockland pumpers furnished a total of four streams, which was all that could be obtained from the available water supply. The fire departments, handicapped by inadequate water supply, did good work in preventing a total loss.

The water mains in the vicinity of the fire were 6-inch in size, and pressures at the scene of the fire were very weak. This condition was known to town officials, who, for many years, have been agitating for better water supplies without results. The question was brought up at the last annual town meeting, but nothing was done about it.

The cause of the fire is not known. The loss was estimated in the vicinity of $80,000. One wing of the building was badly gutted and other sections above the first floor were severely damaged.

Selected Demonstrations for Use in Fire Safety Education

Report by N.F.P.A. Committee on Visual Education.

Richard E. Vernor, *Chairman*

Eugene Chrystal, Sherman Coultas, C. G. Durfee, T. Alfred Fleming, C. A. Lindstrom, Carl E. Milliken, George B. Muldaur, W. A. Noel.

Visualizing the fire prevention story is not a new idea. Witness the vast array of literature long in use, not to mention the posters, booths, banners, bill-boards, parades, charts, window displays, hydrant placards, "Fire Demon" characterizations, films, slides, and other usefully employed media.

Along with the introduction of sound motion pictures and the sound stereopticon, there has been a growing tendency to couple audible instruction with various types of dramatizations and demonstrations, which, with proper "showmanship," has wonderfully increased the effectiveness of the various presentations. One of the first dramatizations was a play, "The Trial of Fire," designed for school children and published by The National Board of Fire Underwriters. Others have followed.

This report makes no pretense of covering all of the demonstrations in use, but rather presents a selection of methods, which have come to the attention of the Committee. It is the hope that the material offered here will stimulate the imagination of the fire safety educator to further employment of audio-visual instruction.

CAUTION—*Where laboratory methods are used, great care must be taken to safeguard the demonstrations, and approved extinguishing apparatus should always be instantly available.*

For a most effective presentation, anyone attempting this type of program should practice speaking while manipulating apparatus, otherwise there are likely to be awkward gaps in the lecture, which will tend to lose the attention of the audience.

Care should also be taken to make certain that the speaker "practices what he preaches" while on the platform, otherwise the effect of the talk will be largely lost. A case in point is the speaker who went into detail on the proper method of discarding a match and three minutes later threw a lighted one into the waste basket. A little practice will result in a good timing of the audible with the visual.

In several of the demonstrations illustrated on the following pages, chemical or other artificial means are suggested to accelerate ignition or to

simulate types of fires which could not safely be reproduced on the lecture platform. Care has been taken, however, that even though artificial means are employed the demonstration will be truly representative of actual fire conditions.

Rather than repeating names throughout the text, a list is given below of persons or organizations to whom the Visual Education Committee is indebted for information, photographs and sketches used here. The number with each picture corresponding to that in the list indicates the source of information. Readers interested in further details of construction or operation of apparatus presented should communicate directly with the sponsors listed.

Sponsors.

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4. G. T. Cook, Engineer, The National Board of Fire Underwriters, 222 West Adams Street, Chicago.
5. R. B. Criswell, Fire Department Instructor, Ohio Inspection Bureau, 431 East Broad Street, Columbus, Ohio.
6. C. G. Durfee, Chemical Fire Extinguisher Association, 560 Belmont Avenue, Newark, N. J.
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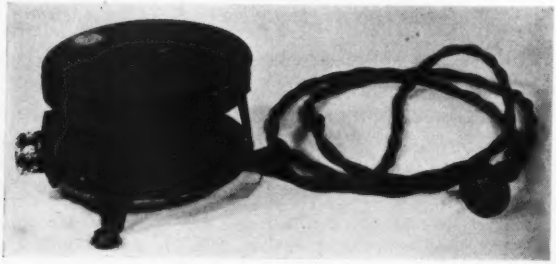
13. Carl G. Lund, Special Agent, Fidelity Phenix Fire Insurance Company, 924 First National Building, Oklahoma City, Okla.
14. H. M. Naylor, District Manager, Kansas Light and Power Company, Topeka, Kan.
15. Lt. Col. E. M. Ranck, Chairman, Fire Prevention Committee, Pennsylvania State Firemen's Association, Box 463, Lancaster, Pa.
16. H. K. Rogers, Fire Prevention Department, Western Actuarial Bureau, 222 West Adams Street, Chicago.
17. E. J. Stewart, Chief Engineer, Kansas Inspection Bureau, 701 Jackson Street, Topeka, Kan.
18. T. M. Walden, Chief, Fire Department, Columbia, Mo.
19. C. B. White, Chemist, American LaFrance and Foamite Corporation, Elmira, N. Y.
20. Chief Arthur A. Buss, Fire Department, Wausau, Wis.
21. Lieut. John E. Beckham, Fire Department, Dayton, Ohio.
22. Lieut. Chas. H. Bessey, Fire Department, Wichita, Kan.
23. Auburn Fire Deparment, Auburn, N. Y.

PART I.

1. Ignition.

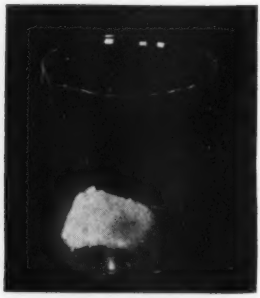
By Conduction



(1)

This electric hot-plate is used for igniting solids with ignition temperatures between 300° and 400° F. It also illustrates how it is possible to ignite these materials if left on a steam radiator.

By Chemical Reaction



(1)

Here is an ordinary laboratory pyrex beaker. In this demonstration caustic and lime with a little moisture are employed to show how both of these chemicals will give off sufficient heat to ignite flammable materials.

By Spontaneous Ignition

The spontaneous ignition experiment consists of putting a number of oily rags in a box with a thermocouple. A large cardboard with the degrees of Fahrenheit is set up with a pointer attachment and operated by the thermocouple. The rags in question are heated so that the rise of the indicator is visible to the naked eye, and an increase of temperature of 20 degrees is reached in about twenty minutes to half an hour. By the time a meeting is adjourned, it will be found that the rags in the box are so hot that it is impossible for anyone to hold his hands on them any length of time.

At one demonstration this experiment prompted considerable comment among the men and was very effective. The large cardboard was semicircular in design, with the degrees of heat posted along the circumference, with the pointer working from an axis at the center. An ordinary metal drum was used for a container, and in preparing this demonstration considerable experimenting was necessary to create the condition of spontaneous ignition so that the illustration would perform when needed.

The apparatus is simple and inexpensive. At the beginning of any meeting the audience

can be informed as to the nature of the experiment, and as the meeting proceeds those in attendance will be able to see the indicator creep up on the dial. At the end of the meeting the receptacle containing the rags or waste may be placed near the exit, where the audience may feel the rags and experience the degree of heat generated.

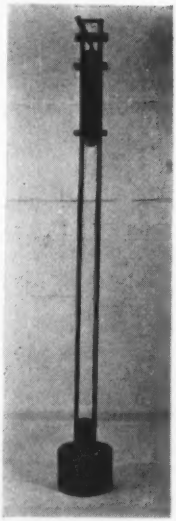
(See also Miscellaneous Common Fire Hazards.)

By Friction

This machine demonstrates how temperatures can be increased to ignite flammable material by friction. The stick is morticed out, over which is placed a 1″ piece of strap iron $\frac{1}{8}$″ thick, perforated on 1″ centers. The material to be ignited is placed under the strap iron and the friction heats the iron to the point of ignition. This particular motor is ¾H.P., 1400 R.P.M. and a 4″ pulley is employed.

(1)

By Percussion



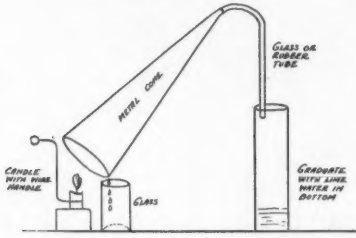
This device consists of a heavy iron block in the base of which there is a seat. Into this a small block 1¼″ in diameter and 1″ high is fitted. This block has a ½″ pin in the top which extends into the second block from the bottom, this block having a ½″ hole all the way through it. The top block is made up with a pin which extends down into the center block and rests on top of the pin in the lower block. Material to be ignited is placed in the center block and the top block put on. Then the weight at the top of the device is dropped, which causes the material to explode.

(1)

By Radiation

Two small cardboard boxes may be used to illustrate ignition by radiation. Both should be weighted inside to prevent toppling over. Ignite one box placed near the other. Do not let exposed box come in direct contact with the burning one. Radiated heat will ignite the exposed box.

2. Products of Combustion.



(6)

Fix a metal cone at an angle so that flame and smoke from a candle will rise into it. Place a glass under the low end of cone mouth. From the small end of the horn run a tight tube (preferably glass) into the top of a graduate in which is a little limewater.

The products of combustion will rise into the horn. The water will condense on the sides and drip into the glass. The CO_2 and nitrogen will be expelled into the graduate. The CO_2 will cause the limewater to become cloudy.

After the process has progressed for a few minutes, move the candle by the wire handle into the gas space in the graduate. The CO_2 will extinguish the flame.

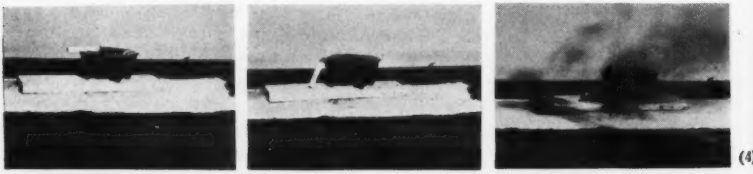
3. Miscellaneous Common Fire Hazards.

There are innumerable ways of demonstrating various common fire hazards. Here are presented a very few suggestions. Others will doubtless occur to the reader.

Individual.

The Ash Tray

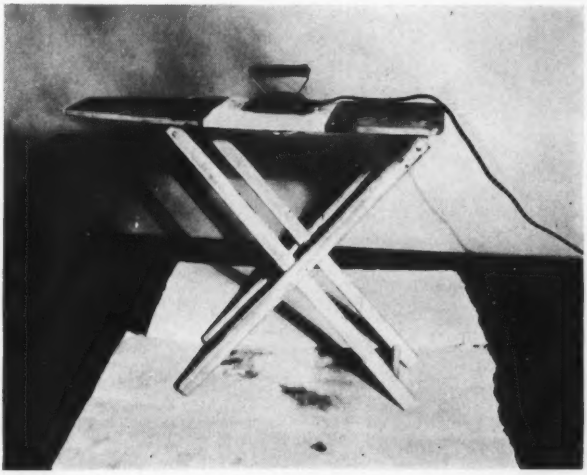
What is likely to happen when a lighted cigarette is left with the lighted end pointing toward the center of the ash tray is illustrated below. To make the ignition certain and more spectacular, the cigarette finally falls on a piece of soft paper, which has previously been soaked in a saturated solution of saltpeter and then dried. As some time elapses



(4)

during this test, the lecturer should proceed with other subjects, coming back to this demonstration as the various stages develop. Note sheet asbestos under apparatus.

The Electric Iron



(4)

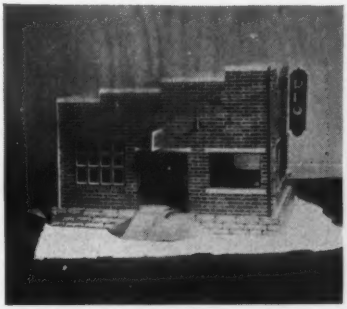
This miniature electric iron provides an effective demonstration. Cut a hole in the board, through which the iron may fall, and cover it with a small sheet of nitrocellulose film wrapped in paper prepared as in the ash tray experiment. Note the sheet asbestos under the ironing board.

Garage Fire and Explosion

Wadded paper or cloth treated with saltpeter is used to simulate the oily rag hazard. Such material is placed on a concealed electric heating unit in the floor of this toy garage. At the left smoke is issuing from the doorway, caused by ignition.

A short fuse is run from the fire to a small countersunk metal dish in the center of the garage floor, in which a small quantity of flashlight powder has been placed.

In the picture at the right, the fire has reached the flashlight powder, illustrating how the initial fire may explode gasoline vapors which may be in the premises.

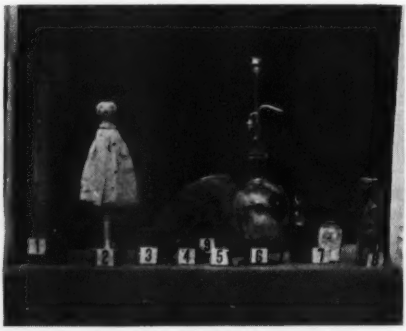


(4)

(4)

Types of Demonstration Equipment.

Staging Used by Lt. Col. E. M. Ranck



(15)

1. Tin tube filled with sand.
2. Rag doll which is burned.
3. Block of wood — solid form.
4. Reduced to shavings to show difference in flammability.
5. Copper wire to show cooling experiment.
6. Glass container for mixing soda and acid.
7. Soda and acid.
8. Rat in jar killed by CO_2 gas.
9. Piece of canvas for smothering fire.

Mr. T. Z. Franklin

(7)

Here is pictured Mr. Franklin, a pioneer in the field of visual teaching, and his elaborate apparatus. The zigzag device illustrates the rapidity of a gasoline explosion; ignition of fumes at the lower end of the long trough, flashing almost simultaneously from the top

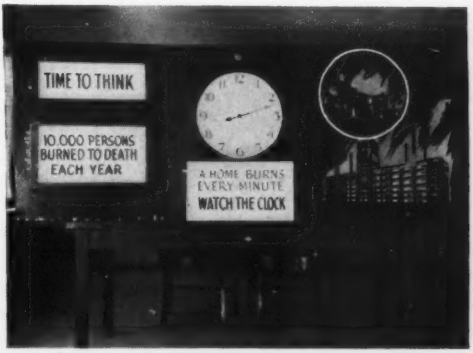
of the glass container fifteen feet away.

The demonstration covers among other features dust explosions, electrical and chemical hazards, flammable volatiles, celluloid toys, film hazards, spontaneous ignition and special holiday dangers.

Mr. R. B. Criswell's Demonstration of Common Fire Hazards

(5)

Lieut. Beckham's Illuminated Panels



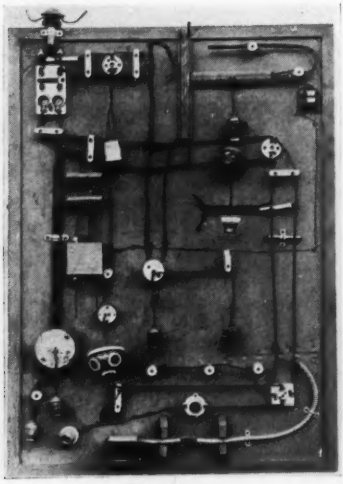
(21)

Figure 1 **Figure 2**

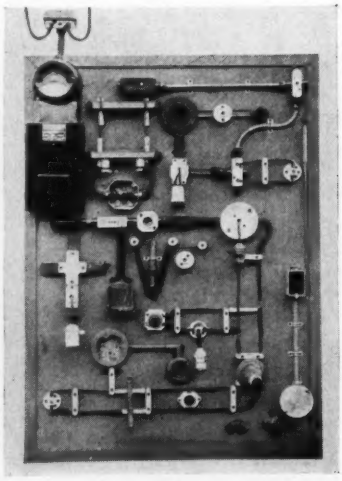
This demonstration equipment is the invention of Lieut. John E. Beckham of the Dayton, Ohio, Fire Department. The clock is Telechron operated and flashes the red bulb above it each minute. The panels on the left contain numerous messages in rotation. The right panel in Fig. 1 is brilliantly colored and is illuminated by equipment shown in Fig. 2. The latter also shows an explosion can containing a spark-plug energized by the batteries and coil pictured.

4. Common Electrical Hazards.

Wiring Panels



Dangerous

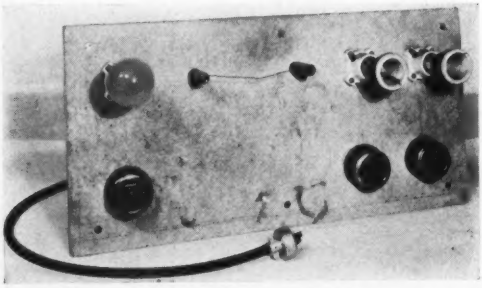


Safe

(10)

Through the employment of these two panels the difference between unsafe and safe practices in electric wiring is easily pointed out. These arrangements of course can be varied to suit the purposes of the lecturer.

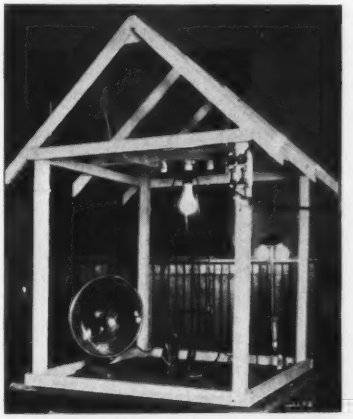
Overloading



(1)

This overloading device is used for the purpose of demonstrating what happens when too many bulbs of too high wattage are used on a line, or when electric drills or floor polishers, etc., are used on electric light lines. All of the current passes through the wire shown on the two posts. This wire, by the way, is iron. When the demonstration is started, the light is lit by the switch directly under it. Then one of the resistance coils is turned on and the wire becomes warm. Then the other resistance coil is turned on and the wire gets hot enough to ignite paper.

Overfusing and Overloading



(14)

In employing this interesting model house, the lecturer pretends to be the house owner, and after putting a penny in the fuse, he sits down beside the apparatus to read the paper. The light is dim, so he adds the light fixture — then he shivers with the cold and adds the heater, and so on. Eventually the wire in the "attic" ignites as illustrated in the photograph. "You in the audience may see it burn," he says, "but, of course, I am in the living room below and don't notice it."

With reference to the apparatus, a section of the wire in the circuit and the fuses are so designed that they will satisfactorily carry the three lamps without burning a fuse or overheating the wire. The addition of the radiant heater is sufficient to blow the fuse, but still does not dangerously heat the wire. After the blowing of the fuse, a penny is placed behind it and the iron is then added. The additional load represented by the iron is sufficient to overheat and completely burn off the special wire within a minute's time.

Fuses, Wiring and Safety-to-life

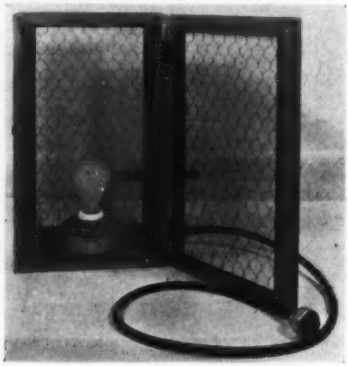
(8)

This attractive staging serves several purposes. Note enlarged drawing of fuses at right of picture. The lecturer refers also to the large chart to drive home his points. The

danger to life in the use of brass shell sockets near grounded surfaces is demonstrated by the doll, which falls over when its hand contacts the socket, but remains inactive when contacted with an insulated socket shell.

Another fire hazard is shown by hanging a piece of grounded pipe across the stage opening. The light socket is connected in series with an electric iron to prevent short circuit, and then the socket is drawn across the pipe, which causes intense sparking.

Unprotected Globes



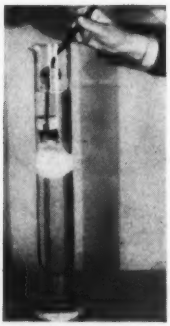
(1)

This device illustrates the danger of failure to use explosion-proof globes or guarded globes in certain places where flammable vapors are present.

Note the box in which there is mounted a fixture and an electric light bulb. The bulb is lighted, the door closed, and a little flammable liquid (about 2 c.c.'s) is poured over the top of the bulb. The bulb is then broken with the plunger. The sparks immediately ignite the vapors, allowing the flame to come out of the top of the box, which is open.

5. Electrical Conductivity of Liquids.

Carbon Tetrachloride

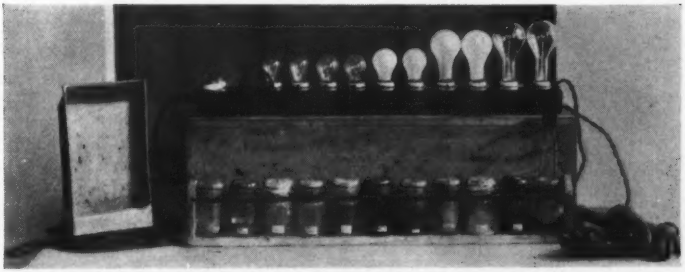


(9)

This simple equipment shows the poor electrical conductivity of carbon tetrachloride.

A socket is stripped of its protecting casing as well as the wires leading to it. Care must be exercised to keep the wires apart to avoid shorting. The socket and bulb are immersed in carbon tetrachloride and the current turned on. The insulating quality of the liquid becomes apparent.

Various Liquids



(5)

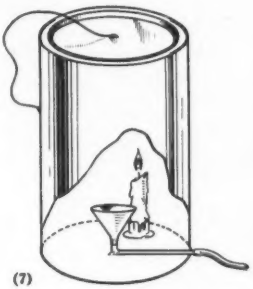
This apparatus is constructed so that current may be passed through any number or all of the light bulbs from 10 to 150 watts. A forked conductor (at the right) is immersed in the jars and the conductivity is indicated by the number and brilliancy of lights which can be illuminated.

Such liquids as distilled water, rain water, mineral water, hydrant water, salt water, soda water, carbon tetrachloride, Karbaloy, foam, etc., are employed.

Care should be taken to wipe the conductor dry between tests.

6. Explosions.

Dust Explosions



(7)

Various dusts, such as starch, flour, aluminum, etc., are easily exploded by means of this can containing a lighted candle, a metal funnel connected to a rubber tube on the outside, and with a captive lid.

A small amount of the material is placed in the funnel. Sudden blowing through the tube results in an explosion.

Vapor Explosions

To demonstrate the explosibility of vapor one type of apparatus has been prepared, using extra heavy pipe and two caps, 6 in. in diameter and 10 in. high, as shown in the following picture. There is a ¾-in. vent in the top in which a cork is placed. A regular standard Ford coil, four dry cell batteries, and a spark plug are used for ignition. The vapor of flammable liquid is drawn in by vacuum, a regular small laboratory water vacuum tube being employed for this purpose. After the vapor is drawn in from a graduate, the

valves are closed and the material ignited. This causes quite a sharp explosion. The quantity of material used is about 5 c.c.'s.

(1)

A Vapor Explosion Chamber

(1)

That vapors from most solvents are heavier than air and that they will travel in an open trough or across the floor is illustrated here. There is a small electric heater in the top of the box on the wall. 5 c.c.'s of acetone are poured into this after it has become warm, and the vapors are ignited by static sparks at the end of the chute. In this instance it takes about three seconds for the vapor to travel from the box to the end of the chute.

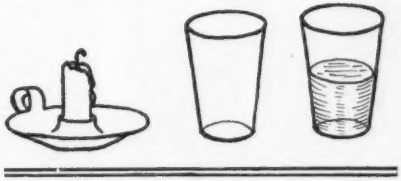
Somewhat similar apparatus may be noted under Miscellaneous Fire Hazards on page 270.

Gasoline Vapor Explosion

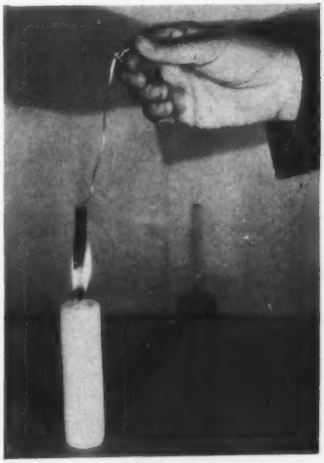
Apparatus quite similar to the dust explosion can pictured on page 275, that is, a small tin can with a compression type lid, such as a sani-flush or bowlene can, will illustrate a vapor explosion vividly. A small nail hole is punched in the side of the can near the bottom. Three or four drops of gasoline, naphtha, or other explosive liquid commonly used for home dry cleaning purposes are dropped into the can, and the cover replaced. A match is held at the nail hole, resulting in the lid being blown off.

7. Extinguishment.

Probably the simplest method of illustrating both smothering and cooling is the employment of a lighted candle and two water tumblers, one empty. Inversion of the empty glass will extinguish the candle by smothering, while, of course, a little water from the filled tumbler will illustrate extinguishment by cooling.



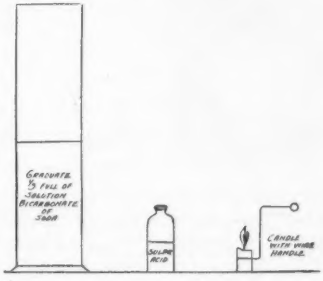
Cooling



Lower over a candle flame a spiral made by wrapping some No. 10 copper wire on a pencil. The flame goes out because the wire absorbs the heat so rapidly it reduces the temperature below the ignition point, without cutting off the air supply.

(6)

Cooling (Soda and Acid)



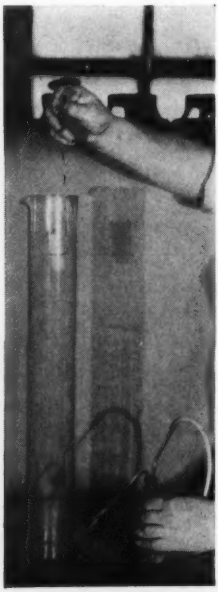
(6)

This experiment explains the action of a soda and acid extinguisher. Pour acid into soda solution and draw attention to gas formation, explaining how the pressure forces water out of device. Lower lighted candle into the gas space in the graduate, showing that the gas therein is CO_2.

It is explained, of course, that the cooling action of the water is what puts the fire out; the CO_2 has practically no part in the practical extinguishment job of the soda and acid extinguisher.

Smothering

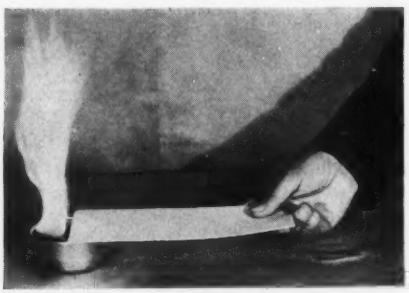
(6)



(6)

That carbon tetrachloride and some other vapors will not support combustion is illustrated above. Force a stream of the fluid against the side of the graduate, or pour the liquid slowly down the inside surface from a cup. Now lower a lighted candle into the cylinder. Extinguishment will result.

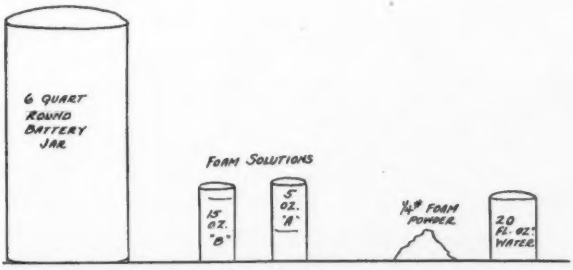
Smothering (Value of Quick Action)



(6)

Slide a blotter quickly over the top of a dish in which gasoline is burning. The edge of the dish must be even and the blotter must be held firmly and evenly on it. Remove blotter and relight the fire. Now slide the blotter slowly forward. The edge will be consumed.

Smothering (Foam)



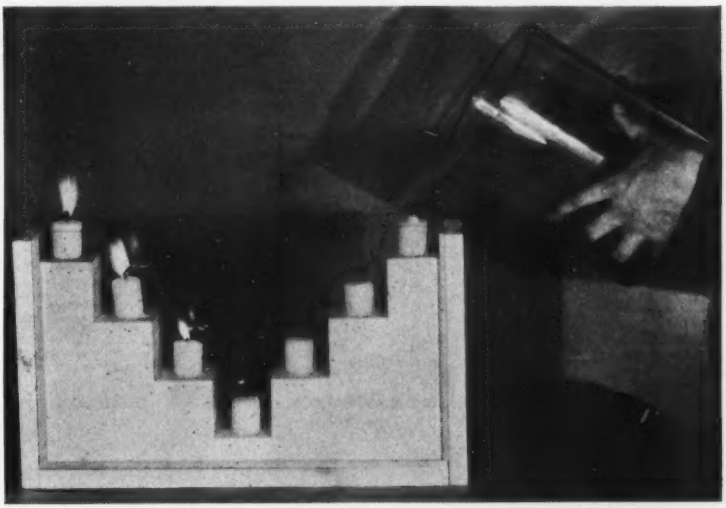
(6)

This equipment shows foam made by mixing prepared solutions or by adding water to mixed powder.

a. Mix the solutions for a 2½-gallon foam extinguisher; take 5 fluid ounces of "A" solution and 15 fluid ounces of "B" solution and mix in a 6-quart jar. Wash out jar and dry it.

b. Put ¼ pound of foam powder (for foam hopper) in bottom of jar. Throw 20 fluid ounces of water violently into the jar and shake the jar roughly for a second or two.

Smothering (Carbon Tetrachloride)



(6)

In the jar, carbon tetrachloride is poured slowly on a piece of burning newspaper. The smoke makes the vapor visible. The paper is withdrawn when the vapor is formed.

Into one end of the apparatus with glass sides is poured the vapor as shown. The vapor flows down the steps and then fills up the apparatus, extinguishing the candles on the opposite steps.

Characteristic of Foam

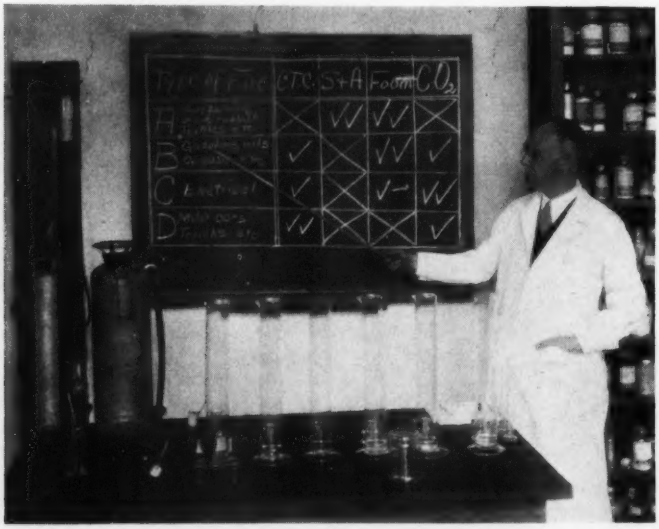
(6)

Here is demonstrated the ability of foam to fill an irregular container — also shows cooling effect of foam.

Mix the solutions for a 2½-gallon foam extinguisher; pour 9 fluid ounces of "B" solution and 3 fluid ounces of "A" solution into a paper bag holding a little over 1 gallon.

Hold the bag over a candle flame. The foam inside will keep the paper from burning.

Types of Chemical Extinguishers

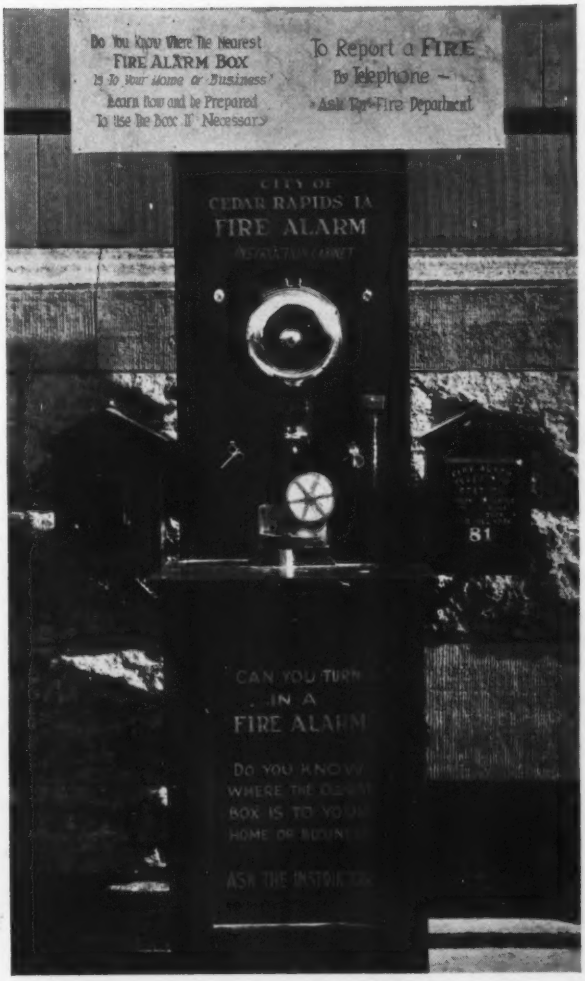


(19)

This picture is an example of a more elaborate set-up for lecturing on several types of extinguishers. In addition to visualizing inside the extinguisher, the address covers not only the construction, care, charging, use and reactions, but also the types best suited for various classes of fires. Subsequent stagings also demonstrate the dry chemical and the loaded stream types of extinguishers.

PART II.

1. A Fire Alarm Demonstrator.



(3)

Designed for public education in the use of fire alarm boxes. This apparatus has been successfully displayed at various schools and on prominent downtown corners. A uniformed fireman is always present to demonstrate the apparatus.

2. Fire Clowns.

"Smoky"

(16)

Having already appeared before over two million children in the first six grades in the middle west, "Smoky" Rogers enjoys widespread popularity. Gaining the confidence and interest of his young audience with his buffoonery, the Clown teaches the simple lessons of home fire hazards and how to act in fire emergencies. That the instruction is effective is evidenced by numerous instances in "Smoky's" files, indicating actual saving of human life because of his teachings.

"Carelessness"

(22)

This characterization, staged by Lieut. Chas. H. Bessey, Engine 4, Wichita, Kansas, has effectively engaged the attention of school pupils. After a demonstration of how to turn in a fire alarm, and the use of hand extinguishers, Lieut. Bessey enters in costume, blowing a small siren whistle and dropping matches carelessly. "Do's" and "Dont's" are then outlined to the audience, which follows The Old Man attentively.

"Old Man Careless"

FOOLS Laugh AT FIRE WISE MEN Respect IT.
'OLD MAN CARELESS'
OUNCE OF PREVENTION BEATS A POUND OF EXTINCTION
TO BE PREPARED Guard IN MANY WAYS
KEROSENE

(13)

Designed to reach all elementary grades, the performance of "Old Man Careless" is another effective teaching method. Control buttons located at various points on the floor "touch off" various incipient fires by means of an electric arc igniting alcohol-soaked cotton. In the photograph, the Clown is about to get into trouble with some home dry cleaning.

3. Magic.

(12)

Magic may be successfully employed to teach fire prevention lessons. Here is a scene from "A Trip to Fireproof Land," with several of the audience costumed to play parts in the piece. The Magician is introducing "Mr. Innocent Looking Match." This picture may suggest other means of using magic to good advantage.

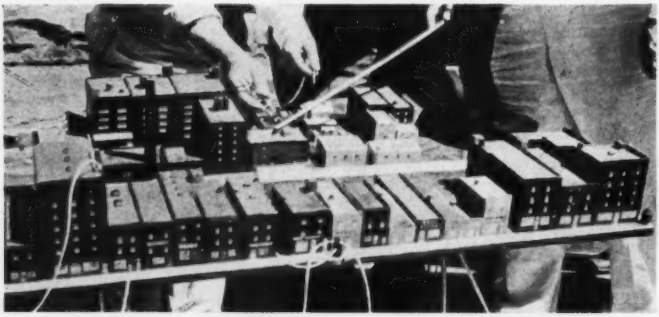
4. Marionettes.

Ever since Punch and Judy engaged our attention for the first time, puppet shows have been popular, probably more so at the moment than at any time in the past. Upwards of a dozen such dramas have been played to thousands of adults as well as children at the recent Century of Progress at Chicago.

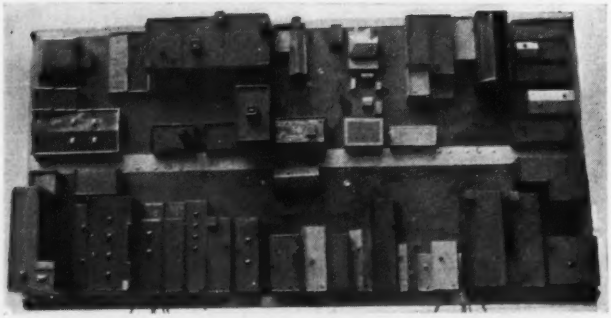
So far as the Committee on Visual Education is able to determine, no shows built about the fire prevention story have as yet been produced, but with thousands of youngsters now building their own equipment, there are interesting opportunities opened up in this field. The committee is at present making a study of it.

5. Miniature Buildings.

City Blocks



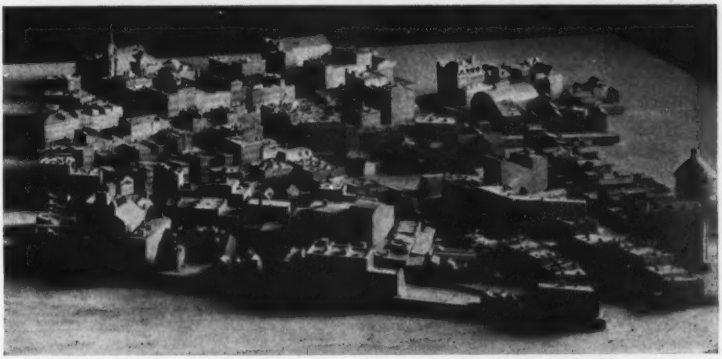
(13)



(13)

The block shown in the two pictures above was developed for use in teaching fire control tactics, the insurance map and insurance rating. Buildings are colored to indicate construction. Miniature hydrants, hose and ladders make it possible to indicate fire department layouts in attacking fires. The buildings are removable. The board folds at the middle, and the whole apparatus packs away in a specially designed trunk.

Auburn, N. Y.

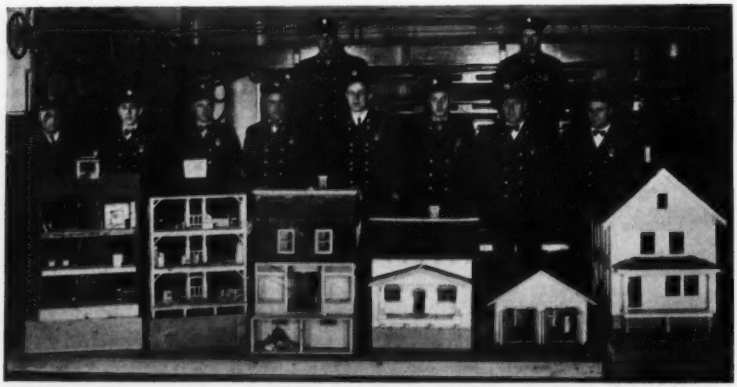


Two views of a scale model of the high-value district of their city constructed by the Auburn, N. Y., firemen. This provides an ingenious device for the study of fire fighting operations. Using the models, imaginary fires have been fought in various blocks, and the best methods of attack in each building determined.

(23)

Individual blocks of the model of Auburn's downtown section may be detached for the study of specific conditions in the block. In this way it is possible for firemen to determine, in advance of a fire, such points as the accessibility of the sides of a building, where hose may be laid or advanced, ladders raised and ventilation accomplished.

Wausau, Wisconsin



(19)

These miniature buildings were built by members of the Wausau Fire Department and are used very effectively before general public audiences in teaching fire hazards and fire protection features in dwelling houses, mercantile establishments and industrial occupancies. They have proved unusually helpful during Fire Prevention Week for demonstration purposes in the Wausau schools.

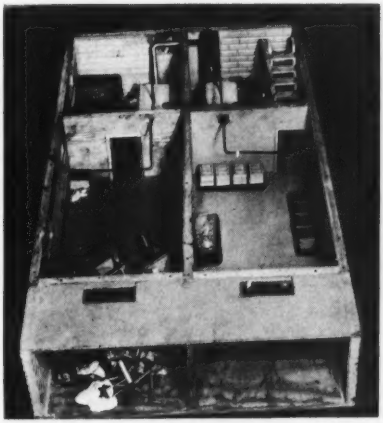
Industrial Miniature

(19)

Here is an open view of two buildings. In the building on the left will be noted poor housekeeping, lumber carelessly piled, and stock blocking windows near ladder fire escape; third floor used as paint shop with open wooden tank for dipping; and oil or paint drum on stand with ordinary spigot, permitting drippings to spread on floor. Note old type of wiring with loose unsoldered and untaped connections. Elevator is of open type, wooden construction with wooden penthouse using ordinary windows. Fire protection consists of wooden water barrels and fire pails, dry standpipe and hose system.

The building on the right shows the results of good housekeeping throughout. Note spray booth on third floor, and paint or oil drum with approved pump indicated. The elevator is the enclosed type with fire doors. Windows are wired glass. Fire extinguishers are placed on each floor, and an automatic sprinkler system covers the entire building.

Mercantile Model



This shows basements of mercantile building. Litter has accumulated under unscreened grating on the left. The basement on this side shows careless rubbish accumulation on floor, ashes in wooden box, boiler too close to wooden partition.

The basement on the right shows good housekeeping, metal containers for rubbish and ashes, steam pipe properly installed through partition. There is also a fire extinguisher at foot of stairs.

(19)

Private Garage

Dwelling House—Roof

(19)

The picture at the left shows the result of putting hot ashes in wooden box placed against garage. Fire has worked up under roof and burned objects in attic. Grease and oil drippings have soaked into wooden floor. No protection is under stove, and smoke pipe passes through wall without protecting band. Rags and litter have been carelessly left about floor. Note extension cord hung over hook and branch wires not soldered or taped.

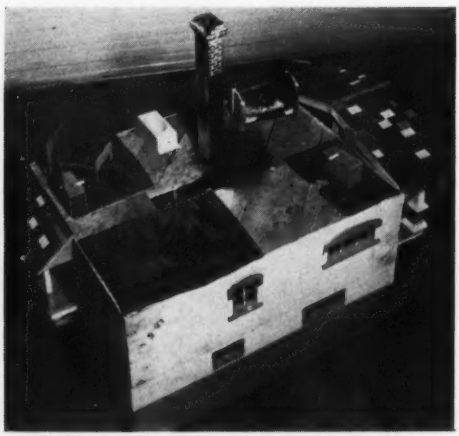
At the right we see two types of roofing: fire-resistive on one side and wood shingles on the other. A spark from the chimney has set fire to the wood shingles.

Dwelling House—First Floor

(19)

This picture shows several fire hazards: floor not protected under stove, fuel box too near stove, ironing board charred as a result of iron forgotten with current on, and cigarette carelessly placed on davenport. Note where fire came through floor near chimney from furnace in basement.

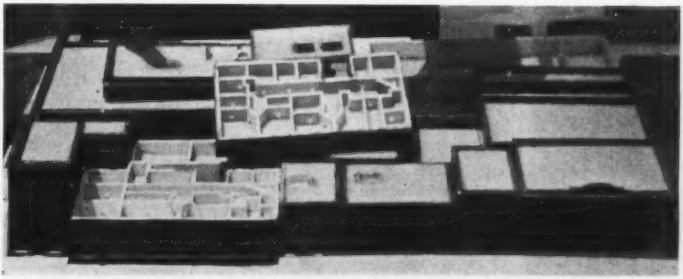
Dwelling House—Second Floor



(1[illegible])

This picture shows where fire followed the stairway to second floor, cutting off exit of occupants in bedrooms. The bed near the head of the stairs was in the path of the fire. The careless use of cigarettes is again illustrated here.

An Actual Replica



(18)

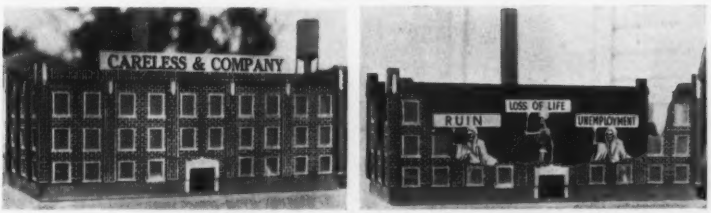
Above is a recently built replica of a downtown block in Columbia, Missouri. Each building is modeled in such a way that each story can be removed and a separate study made of each floor. Every opening, partition and fire wall is shown. The second and third floors of the Exchange National Bank Building are shown separated. Needless to say, the local fire department knows in advance just how it is going to handle fires in this block.

Other Types

These buildings, designed for firemen's training courses, are also colored to indicate construction. The scale is ¼″=1′. Sand was spread over the paint on the roof to give a gravel effect.

(17)

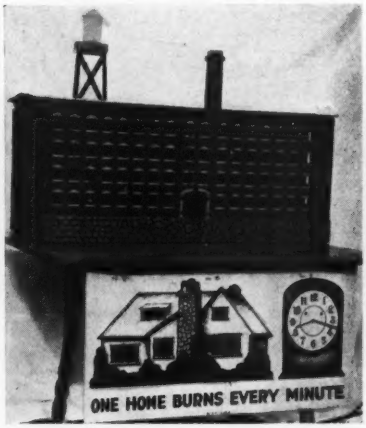
Industrial Plants

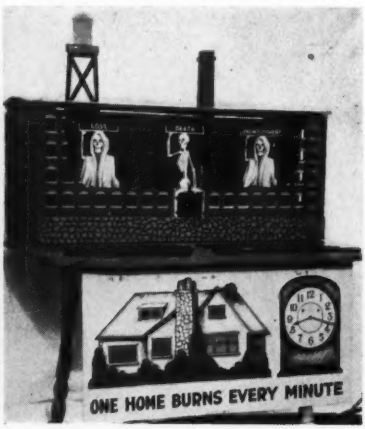


(13)

This interesting model develops into ruins while the speaker is discussing industrial fires. Fire, explosion, and falling walls, followed by specters rising from the ashes, provide a spectacular demonstration. A cleverly arranged cam shaft, illuminating devices, and a control button concealed in a book cover several feet from the model, enable events to develop in logical order without apparent interference by the speaker. The whole equipment packs away in a large suitcase.

Below is a similar set-up to that shown on the previous page, of an industrial plant with a slightly different type of building.





(15)

6. Ventriloquism.

(2)

This entertaining fireman is not to be outdone in originality. Needless to say, he is a very welcome visitor in the Lansing, Michigan, schools with his dummies, "Ray" and "Jay," who promote a lively discussion of fires and their prevention.

Fires in Which There Was Loss of Life.

Third Quarter, 1934.

Since the publication of the October QUARTERLY, the N.F.P.A. Department of Fire Record has received from various sources 220 reports of fires in which there has been loss of life. A total of 392 lives were lost in these fires, including the 32 fatalities incident to the burning of the Kerns Hotel, Lansing, Mich., a report of which appears on page 223 of this QUARTERLY. Other single disasters involving a loss of eight or more lives have occurred during this period as follows:

OCTOBER 20, 1934, WINNIPEGOSIS, MAN. Nine persons lost their lives when a small rowboat, into which they had climbed when their motorboat caught fire, was swamped. The victims, including three women and three children, were forced into the small boat when a gasoline explosion set fire to their power boat. One of the four men in the party swam ashore.

NOVEMBER 12, 1934. AVALON, CALIF. Eight men were burned to death when 7500 pounds of blasting powder, which they were transferring from cans to canvas sacks at a quarry, ignited.

Loss of Life Fires, October-December, 1934.*

This is a typical rather than a complete record, presented to show the conditions under which loss of life occurs, that they may be known and guarded against. The total loss of life by fire in the United States is estimated at 10,000 annually.

Class of Fire	No. Fires	Men	Women	Children	No Data	Total
Airplane fires	5	9	0	0	0	9
Apartments, hotels, lodgings, tenements, etc.	13	37	10	5	0	52
Automobile fires	13	17	10	2	0	29
Barns and stables	6	3	0	4	0	7
Dwellings—Rural	51	19	25	50	2	96
Dwellings—Urban	65	20	41	30	0	91
Forest fire	1	1	0	0	0	1
Grain elevators	2	8	0	0	0	8
Industrial occupancies	10	12	0	0	3	15
Institutions	5	5	0	1	0	6
Mining property	2	3	0	0	0	3
Munitions factory	1	3	0	0	0	3
Oil refinery	2	3	0	0	0	3
Oil well	1	1	0	0	0	1
Other buildings	14	17	1	2	0	20
Outside of buildings	14	12	6	3	0	21
Ships and boats	5	7	3	5	0	15
Railroad rolling stock	1	2	0	0	0	2
Response to alarms	3	3	0	0	0	3
Tank ships and barges	2	3	0	0	0	3
No data	4	4	0	0	0	4
Total	220	189	96	102	5	392

*This table is made up from those reports received by the Department of Fire Record between September 20, and December 20, 1934. A few of the fires included herein occurred prior to September 20, but were not reported until subsequent to that date.

The outstanding fatal fires occurring outside of the United States and Canada during the period covered by this record have been as follows:

SEPTEMBER 22, 1934. WREXHAM, WALES. Two hundred and sixty-two miners lost their lives when entombed in the Gresford collieries by an explosion and fire.

OCTOBER 2, 1934. ENGLISH CHANNEL. The pilot and six passengers were killed when a London-Paris express plane caught fire over the English Channel and dropped into the sea.

OCTOBER 9, 1934. ST. GOBAIN, FRANCE. Fire occurred in an iron pyrites mine connected with a chemical factory and caused the death of thirty-four miners.

NOVEMBER 10, 1934. HOKKAIDO, JAPAN. An explosion in a colliery on this island killed thirty-seven miners.

DECEMBER 6, 1934. NEAR PERPIGNAN, FRANCE. Sixteen persons were killed and thirty-eight were injured when film ignited as an itinerant motion picture operator exhibited his film in a barn. The operator attempted to throw the film away, but it set fire to the hay and instantly the whole structure was aflame.

DECEMBER 10, 1934. TORTOSA, SPAIN. Eight persons were burned to death and several others were injured when fire occurred in a room in the town hall where motion pictures were being shown.

Causes of Loss of Life, October-December, 1934.

Fatalities classified according to the immediate cause of the loss of life rather than according to the cause of the fire.

	Men	Women	Children	No Data	Total
Airplane fires	9	0	0	0	9
Automobile fires	17	10	2	0	19
Boiling wax spilled on stove	1	0	0	0	1
Chemicals and explosives:					
Munitions factory	3	0	0	0	3
Children alone in house	0	0	15	0	15
Children and matches	0	0	5	0	5
Clothing ignited:					
Backfire of furnace	1	0	0	0	1
Bonfire or incinerator	3	5	1	0	9
Candle	0	0	1	0	1
Children playing with blow torch	0	0	1	0	1
Fireplace	0	2	1	0	3
Oil lamp or stove	1	2	2	0	5
Stove or heater	1	8	1	0	10
Turpentine on clothing	0	0	1	0	1
No data	1	0	0	0	1
Dust explosion					
Grain dust	8	0	0	0	8
Entering or re-entering burning building	2	3	1	0	6
Escaping from fire:					
Drowned	3	3	3	0	9
Jumped	3	0	0	0	3
Explosions (miscellaneous)					
Acetylene gas plant	1	0	0	0	1
Asphalt mixing process	2	0	0	0	2
Blasting powder or dynamite caps	9	0	0	0	9
City gas	1	1	1	0	3
Cold storage plant (ammonia)	2	0	0	0	2
Cutting alcohol drum with acetylene torch	2	0	0	0	2
Fatty acid still in soap factory	0	0	0	3	3
Gasoline blow torch	2	0	0	0	2

	Men	Women	Children	No Data	Total
Oil switch	2	0	0	0	2
Paper products plant	2	0	0	0	2
Whiskey stills (illicit)	4	0	0	0	4
No data, possibly incendiary	0	2	4	0	6
Fire fighting—civilians	3	0	0	0	3
Fire fighting—firemen	2	0	0	0	2
Flammable liquids or vapor:					
Benzol vapor ignited	1	0	0	0	1
Can of gasoline in garage ignited	0	0	1	0	1
Cleaning clothing with flammable liquids	1	15	1	0	17
Cleaning with gasoline—miscellaneous	3	1	0	0	4
Explosion of pipe line being welded at oil refinery	1	0	0	0	1
Crude oil used to start fire	0	1	0	0	1
Gasoline explosion—no data	0	0	1	0	1
Gasoline still explosion	1	0	0	0	1
Gasoline stove explosion	0	1	0	0	1
Gasoline used to start fire	1	1	3	0	5
Gasoline vapor on boat	2	0	0	0	2
High test distillate used to start fire	0	0	3	0	3
Kerosene explosion—no data	0	2	0	0	2
Kerosene used to start fire	2	7	6	0	15
Looking into oil tank with match	0	0	3	0	3
Menthol still explosion	1	0	0	0	1
Oil stove explosion	1	0	0	0	1
Oil furnace explosion	4	0	0	0	4
Repairing oil stove by candlelight	0	1	0	0	1
Tank ships or barge	3	0	0	0	3
Forest fire fighting	1	0	0	0	1
High tension wires fell at fire	0	0	1	0	1
Mine fires and explosions	3	0	0	0	3
Overcome by smoke—suffocation	10	7	4	0	21
Overexertion or excitement	4	0	0	0	4
Oxygen tent in hospital ignited	0	0	1	0	1
Railroad fires	2	0	0	0	2
Response to alarms	3	0	0	0	3
Ship fires	3	0	2	0	5
Smoking in bed	7	1	0	0	8
Tank truck struck house	0	0	0	2	2
Trapped in burning building	50	22	31	0	103
Trapped in wreckage of home struck by tornado	0	1	4	0	5
No data	0	0	1	0	1
Total	189	96	102	5	392

Typical Loss of Life Fires.

Children Alone in House.

L-2726. ST. GERMAINE, P. Q., SEPTEMBER 30, 1934. An eight-year-old boy, sick in bed, was trapped and fatally burned and his brother and sister were severely burned, when the girl used kerosene to kindle a stove fire. Their parents were at church.

L-2727. SAN GABRIEL, CALIF., NOVEMBER 4, 1934. Three children, the oldest three years of age, were burned to death in their suburban home while their parents were at a store. The mother was badly burned when she attempted to save the children on her return.

L-2728. FAIRFIELD, CONN., NOVEMBER 8, 1934. A man and his wife lost their lives together with a son they were attempting to save, when they rushed into their blazing home in search of the child. The blaze occurred while the parents were at a near-by house, leaving two children alone at home. A younger child escaped and informed them of the fire.

L-2729. INKSTER, MICH., NOVEMBER 13, 1934. Four children, ranging from five years to three months of age, were burned to death when their home caught fire while the mother was at a neighbor's house. The rapid spread of the fire is attributed to an explosion of an oil heater.

L-2730. RIVER FRONT, ARK., DECEMBER 3, 1934. A futile effort to rescue three sleeping children from a burning houseboat resulted in the loss of five lives, when the parents rushed into the craft and were also burned to death. The parents were at a near-by store, after putting the children in bed, when informed of the fire.

Clothing Ignited from Bonfire.

L-2731. EASTERN PASSAGE, N. S., SEPTEMBER 29, 1934. An elderly woman was fatally burned when her clothing ignited from a rubbish fire in the yard of her home. Five persons were badly burned on their hands while trying to beat out the flames on her clothing.

L-2732. ENGLEWOOD, N. J., OCTOBER 30, 1934. A seventy-four-year-old woman, whose clothes caught fire while she was burning leaves in front of her home, died in a hospital. At the time of the accident the victim tore most of the burning clothing off and in spite of her injuries called help by telephone.

L-2733. ENGLEWOOD, N. J., NOVEMBER 17, 1934. In a second similar fatal accident in this city in less than a month an elderly woman was fatally burned while burning leaves in her yard.

L-2734. GILROY, CALIF., NOVEMBER 25, 1934. A six-year-old boy, celebrating his birthday by dancing around a fire in a new Indian costume, was fatally burned when the flames ignited the headdress. While his parents watched, the child clutched a tomahawk and danced around the fire until the wind suddenly whirled the flames against the feathers. They were unable to save him.

Gasoline Used to Start Fire.

L-2735. WOONSOCKET, R. I., NOVEMBER 3, 1934. A seventeen-year-old girl died in a hospital of burns received when a can of gasoline exploded in her hands. The accident occurred as she was pouring the liquid, which she had mistaken for kerosene, on to the fire in a kitchen stove.

L-2736. INDIANAPOLIS, IND., NOVEMBER 27, 1934. A ten-month-old baby and a thirteen-year-old girl were burned to death when the girl used gasoline to hasten the lighting of a kerosene oil stove. In the absence of her mother who was at a store, the child attempted to speed up the ignition of the stove by pouring gasoline on the oil burner flames, causing an explosion.

Kerosene Used to Start Fire.

L-2738. BROKEN BOW, NEB., SEPTEMBER 19, 1934. A woman was fatally burned when she used kerosene to hasten a slow fire in the kitchen range. In spite of her painful burns she carried her children from the house and returned to extinguish the flames before going into a field seeking her husband's help.

L-2739. MUNCIE, IND., OCTOBER 26, 1934. A young woman was burned to death when she threw kerosene on the live coals in a heating stove. Her mother was seriously burned trying to save her.

L-2740. DECATUR, IND., OCTOBER 27, 1934. An eighteen-year-old girl was badly burned and died in a hospital as a result of burns when she attempted to start a fire in the kitchen stove with kerosene.

L-2741. CINCINNATI, OHIO, NOVEMBER 15, 1934. Six negroes, a mother, four children, and a visitor, lost their lives in a blast which occurred when the mother threw a lighted match into a stove which had been primed with kerosene. The four children were in their beds in the room and were trapped when showered by blazing kerosene. A man, visiting the home, died in an attempt to save the children.

L-2742. PRINCETON, IND., NOVEMBER 17, 1934. A woman was burned to death when a can of kerosene, which she was using to rekindle a stove fire, ignited. Her husband was badly burned in an attempt to rescue the victim.

L-2744. FLAT ROCK, ILL., NOVEMBER 28, 1934. Three persons were burned to death and nine others suffered minor burns when an explosion of kerosene used to kindle a fire caused the destruction of their home. The victims, who were fatally burned, were a father, his mother and a daughter.

Live Wire Fell at Fire.

L-2745. NEAR SAVANNAH, GA., DECEMBER 12, 1934. A fire, which destroyed a dwelling, caused the breaking of a high tension electric feeder near by. The falling wire struck the porch of a house about seventy-five feet from the burning building, electrocuting a five-year-old colored boy on the porch.

Oil Burner Fire.

L-2747. WASHINGTON, D. C., NOVEMBER 17, 1934. A university professor, noted as a welfare authority, died of burns received when an oil fired heater flared back in the basement of his home. The victim was attempting to adjust the heater and as he opened the door a flare-back sent a blast of blazing oil over his body.

Oxygen Tent Fire.

H-38726. LOUISVILLE, KY., NOVEMBER 14, 1934. A seven-year-old boy under treatment in an oxygen tent at a hospital was fatally burned when his grandmother, not realizing the danger, introduced a birthday cake with lighted candles into the enclosure. The oxygen caused a flare-up, enveloping the canvas enclosure. No attendants were in the room at the time and the boy was dead when a doctor reached him.

National Fire Protection Association

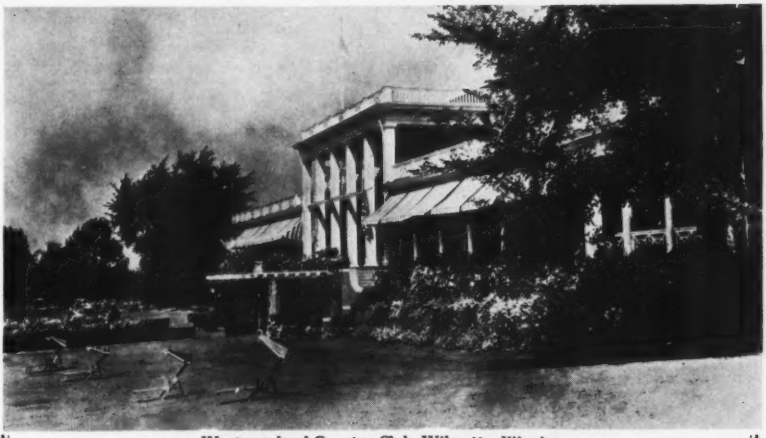
INTERNATIONAL

Executive Office: 60 Batterymarch St., Boston, Mass.

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the coöperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes over a hundred national and regional societies and associations and more than three thousand individuals, corporations, and organizations.

The QUARTERLY is one of a large number of publications issued by the Association and sent to the members as published. These include the monthly *News Letter*, standard regulations on fire prevention and fire protection, special reports and bulletins, the Year Book, and the Proceedings of the annual meetings.

Membership in the National Fire Protection Association is open to any Society, Corporation, Firm or Individual interested in the protection of life or property against loss by fire. All the valuable engineering and popular literature issued by the Association is sent, as issued, to every member. The Association is the clearing house for all the authoritative information on Fire Protection and Prevention, and members are privileged to submit to it their individual problems for solution. The Association is always glad to send samples of its publications to prospective members upon request.



Westmoreland Country Club, Wilmette, Illinois.

PROTECTION
THAT PAYS A PROFIT!

Several directors and members of the Westmoreland Country Club, engaged in the fire insurance business, realized that should a fire start in the Clubhouse, the chances of stopping it before the building was demolished were rather remote.

A Viking Dry Pipe System was installed, during a time when the building was in full operation and without annoyance to any member.

Full protection is now assured—the insurance rates have been cut 45%, which reduction will allow the system to pay for itself in 5 or 6 years—and after that, there will be an annual saving of $1,400.00 every year!

● Write for your free copy of this new fully illustrated Catalog, giving valuable information about automatic fire prevention.

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Dallas-Houston, Texas—Texas Automatic Sprinkler Co.
Detroit, Mich.—Viking Sprinkler Co.
Grand Rapids, Mich.—Viking Automatic Sprinkler Co.
Huntington, W. Va.—C. W. Hutchinson, Inc.
Indianapolis, Indiana—Indiana Automatic Sprinkler Co.
Kansas City-St. Louis, Mo.—Walton-Viking Co.
Los Angeles-San Francisco, Cal.—Viking Automatic Sprinkler Co.
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Toronto, Ontario—Viking Automatic Sprinklers, Ltd.

THE VIKING CORPORATION
HASTINGS, MICHIGAN

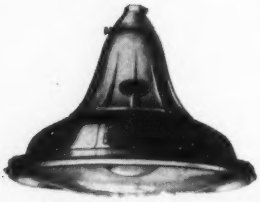
BENJAMIN LIGHTING FIXTURES

for HAZARDOUS LOCATIONS

200-Watt Explosion-Proof with Totally Enclosed Lamp and Reflector

BENJAMIN EXPLOSION-PROOF FIXTURES

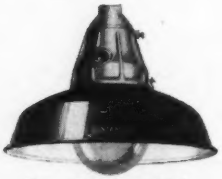
For installation in Class 1, Group D, Hazardous Locations—atmospheres containing the vapors of gasoline, common petroleum, ethyl alcohol, methyl alcohol, acetone and lacquer solvents. All parts of ample strength, designed to withstand internal explosions without breaking down or permitting flame to escape. For 200 watts, with totally enclosed lamp and reflector; for 100 and 150 watts, with lamp enclosed in a special heat resisting glass globe designed to withstand high internal pressures and with or without porcelain enameled steel reflectors. Benjamin Explosion-Proof Fixtures can be furnished in either pendent type for rigid conduit mounting or with ceiling junction box. Listed by Underwriters' Laboratories.



"Vapor-Seal" Fixture

BENJAMIN "VAPOR-SEAL" FIXTURE

Designed especially for Class 2, Group G, and Classes 3 and 4 Hazardous Locations. Vapor-tight threaded connection between hood and reflector. Glass cover, with gasket and aluminum pressure rings bolted to extension bead on reflector. Listed by Underwriters' Laboratories.



Type II-G Dust-Tight Fixture

BENJAMIN TYPE II-G—DUST TIGHT FIXTURE

A new Benjamin unit to meet present Underwriters' requirements for locations where dust and inflammable particles create a fire hazard. Same type head as "Vapor-Seal," but with screw thread enclosing globe. Can be furnished with or without reflector.

Write for full information on the use of lighting in hazardous locations and Benjamin fixtures which meet Underwriters' Laboratories requirements.

BENJAMIN ELECTRIC MFG. CO.

General Offices and Factory

DES PLAINES, ILLINOIS

Divisional Sales Offices

NEW YORK :: CHICAGO :: SAN FRANCISCO

A ROOM

With a View

To Winter Comfort

A SOJOURN at these genial seaside hotels offers the pleasantest outlook on winter. The warm Gulf Stream runs past our door, tempering that briny air which is so good for you. You may golf all winter long if you like, or ride horseback on the sand, or doze in the sunshine on our long Ocean Decks.

Within the hotels a warmth of hospitality makes you feel right at home. Your cheerful, spacious room offers quiet and retirement. The lounges are friendly places where tea time draws a fashionable throng and musicians like to give informal concerts. There are also squash courts, game rooms, health baths, dances and varied entertainments to brighten the winter scene.

Why not run down for a holiday soon? We'll take a genuine interest in making your visit a happy one. Delicious meals. Reasonable rates. American and European Plans. Also special weekly rates.

LEEDS AND LIPPINCOTT COMPANY

Chalfonte-Haddon Hall

ATLANTIC CITY

Insurance Officials Should Advocate Direct Connection of Sprinkler Systems to Municipal Fire Departments Through MASTER FIRE ALARM BOXES

THE CITY OF PORT ARTHUR

PORT ARTHUR, ONTARIO

November 20, 1934

S. Skidmore, Esq.
Worcester Fire Ext. Co.
Montreal, Quebec

Dear Sir:

In answer to your letter of recent date re fire at the News Chronicle Office, this city, I reply as follows:-

The fire started in a box of waste paper in the Basement, said box was within a few inches of a wooden partition, and when we got down into the basement after having received the call through Box #1-2-1, which is connected to the Sprinkler-system, we found that the sprinkler system had done its work so well that there was very little for us to do, outside of just "poking and feeling around for any loose sparks that may have been missed by the system". Fortunately, the fire started where it did start and there was very little damage by water; all of this information is submitted to you with great pleasure.

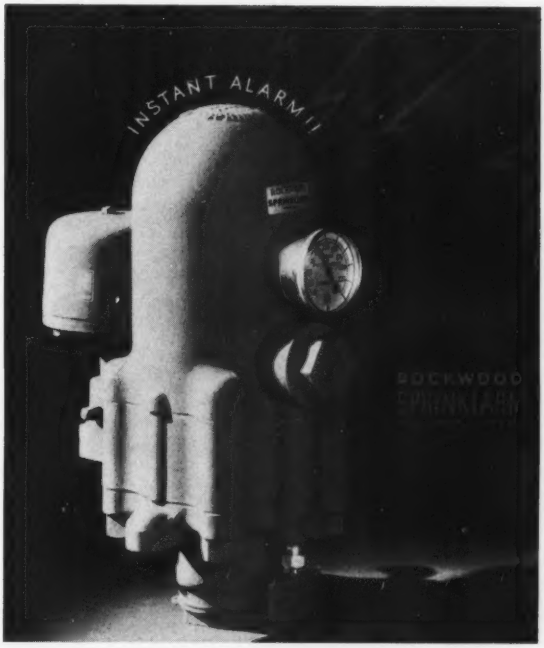
Yours truly,
ALEX HOPE,
Chief of Fire Department

Week by week, more than 4000 *Master* Type Fire Alarm Boxes are building up a service record in both the United States and Canada that should interest every fire insurance official — a record that indicates hundreds of thousands of dollars saving in fire and water damage to insured properties.

Described above is just another case where a *Master* Type Fire Alarm Box connecting a sprinkler system directly to the municipal fire department saved many dollars in water loss. This connection is known as the Gamewell *Sprinkler Watchman.* Would you like a descriptive booklet?

THE GAMEWELL COMPANY - - Newton, Mass.

"A Box a Block"



AS EFFICIENT AS THE SPRINKLER HEAD

N.F.P.A. fire records for the past thirty-five years are an amazing story of the efficiency of the sprinkler head. Now — for the first time — the sprinkler alarm has been made as efficient as the sprinkler head.

ROCKWOOD SPRINKLARM operates on a drop in pressure rather than a flow of water. The alarm is quicker — false alarms are eliminated — signals are received even though water is shut off.

Why not specify Rockwood Systems and get the exclusive advantage of this tremendous improvement. Bulletin on request.

ROCKWOOD SPRINKLER COMPANY
Worcester, Mass.

WORCESTER FIRE EXTINGUISHER COMPANY
Canadian Company

Just off the press . . . . . .

The Volunteer Fire Company

By William Draper Brinckloe

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Books and Bulletins

The author of this new book describes himself as "an old volunteer fireman from a very old company." Mr. Brinckloe was the leading spirit in the organization of the Volunteer Firemen's Section of the N.F.P.A. Written for the use of volunteer fire companies, private fire departments, farmers' organizations, civic organizations, women's clubs, firemen's schools, insurance men and citizens generally, *The Volunteer Fire Company* is not in any sense a textbook, but an intensely interesting story of volunteer fire departments and volunteer firemen. A dozen leading fire protection engineers who reviewed the manuscript for technical accuracy all reported they found the text as interesting reading as a good novel and could not put it down until they had read every page.

Mr. Brinckloe, as President of the Easton, Maryland, Fire Department, the Maryland State Firemen's Association and other fire fighting organizations, a member of the American Institute of Architects, the American Society of Agricultural Engineers, the American Legion and other organizations and a writer of national reputation, presents this story which is at once fascinating reading and technically accurate. The book is sponsored by the Committee on Farm Fire Protection of the National Fire Protection Association, which has reviewed it and finds all its recommendations consistent with the official standards of the Association.

The book is an attractive cloth bound volume of 168 pages with 24 illustrations of volunteer fire department apparatus, equipment and fire fighting methods. The book is published by the National Fire Protection Association at the nominal charge of $1 per copy, postpaid.

NATIONAL FIRE PROTECTION ASSOCIATION

60 Batterymarch St., Boston, Mass.

SAFE

FILMS FOR THE MEDICAL AND DENTAL PROFESSIONS

●

ALL Eastman X-ray and Dental X-ray Films, as well as Cardiographic Film, are made on "safety" base exclusively. Other Eastman films suggested for clinical photography—*Process, Portrait Panchromatic, Par Speed* and *Super Speed Portrait*—are available with either acetate or nitrate base. In ordering these the user simply need specify "safety base" and he will get, at no extra cost, film that presents even less hazard than newsprint paper. Eastman Kodak Company, Rochester, N. Y.

EASTMAN

SAFETY FILMS

NOFUZE "DE-ION" BREAKERS *make wiring protection* PERMANENT

Above—*Cutaway view of a Westinghouse "De-ion" Circuit Breaker similar to those used in the Panelboard shown below.*

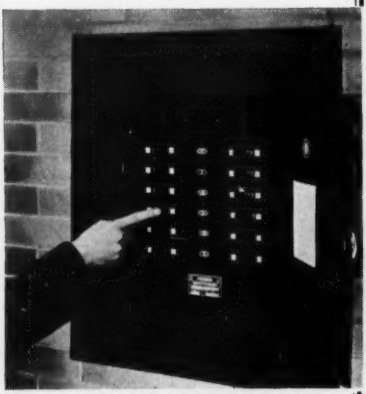
Below—*A Westinghouse Nofuze Panelboard. When a short circuit or heavy overload occurs, the breaker protecting that circuit automatically opens. After the overload is removed, and only then, service can be restored instantly by a mere flip of the breaker handle.*

THERE is nothing to burn out or replace when electrical circuits are protected by Westinghouse Nofuze devices. Their "De-ion" Circuit Breakers, which replace fuses, provide *permanent, certain* protection that is tamper-proof. They completely eliminate the hazards of blocking blown fuses with pennies, wires and other makeshift electrical conductors.

Protection is *permanent* because the "De-ion" Breakers are accurately calibrated at the factory, and *sealed* in a molded housing.

Protection is *certain* because the breaker trips free from its handle when interrupting the circuit under harmful overload conditions. No one can hold it closed, or block its opening action.

"De-ion" breakers are used on Westinghouse Nofuze Load Centers and Panelboards for homes and buildings, and on Nofuze Circuit Breakers for industrial applications. *They are approved by the Underwriters' Laboratories.*



Westinghouse

T 85093

A.D.T. —THE ONLY PROTECTION THAT EXCLUDES CHANCE

A. D. T. excludes CHANCE from fire protection—*because it eliminates failures of the human element.*

A. D. T. Central Station Protection Services function twenty-four hours a day, every day in the year. They place your protective measures under the constant supervision of an outside agency, in continuous direct-wire contact with fire fighting forces. Any abnormal condition of the protective system is instantly reported to the Central Station—corrective action is taken immediately.

The effectiveness of A. D. T. Protection is proved by its record—during the last five years, A. D. T. protected properties, representing values of more than twenty billion dollars, were 99 96/100% immune from fire loss.

A. D. T. PROTECTIVE SERVICES

A. D. T. Sprinkler Supervisory Service: Automatically summons Fire Department in case of fire or dangerous leaks. Electrically detects and reports any impediment to normal functioning of sprinkler system.

A. D. T. "Aero" Automatic Fire Alarm: Automatically detects fire and reports exact location to Fire Department.

A. D. T. Watchman Supervisory and Manual Fire Alarm Service: Any deviation from watchman's routine instantly and automatically reported to A. D. T. Central Station. In emergency, an armed and bonded A. D. T. patrol immediately investigates. Also provides fire alarm boxes for manual operation.

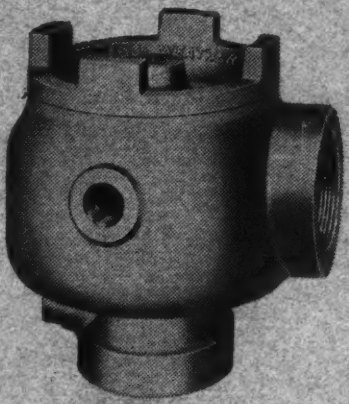
Controlled Companies of AMERICAN DISTRICT TELEGRAPH CO.
155 Sixth Avenue · · New York, N. Y.

A.D.T. SYSTEM

A NATION-WIDE PROTECTION SERVICE AGAINST FIRE, BURGLARY AND HOLDUP

A.D.T

WHY *Risk The Entire Property?*



(Patent Applied For)

THE COLD WEATHER VALVE

Converts a Section of a Wet System Into a Dry one

Insures 100% Protection In Winter

No longer is it necessary to risk the danger of fire menacing an entire plant simply because a section of the wet pipe sprinkler system has been shut off to prevent freezing in an unheated section of the premises during the winter months.

The Cold Weather Valve has been developed by the Automatic Sprinkler Industry, in coöperation with the Insurance Companies to enable property owners to safeguard themselves against this hazard. It performs the same service for small, unheated systems that dry pipe valves render freezing areas in large systems. Manufactured in the 2″ size only, it insures 100% protection by the automatic sprinkler system during the entire year.

The Cold Weather Valve has been approved by Underwriters' Laboratories and Factory Mutual Laboratories.

GRINNELL COMPANY
INC.

EXECUTIVE OFFICES
PROVIDENCE RHODE ISLAND

Offices in all Principal Cities of the United States and Canada.